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THE

DENTAL COSMOS:

A

MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

EDWARD C. KIRK, D.D.S., Sc.D., LL.D.

Observe — Compare — Reflect — Record.

VOLUME LIX—1917.

PHILADELPHIA:
THE S. S. WHITE DENTAL MANUFACTURING CO.
CHESTNUT STREET, CORNER OF TWELFTH
1917.

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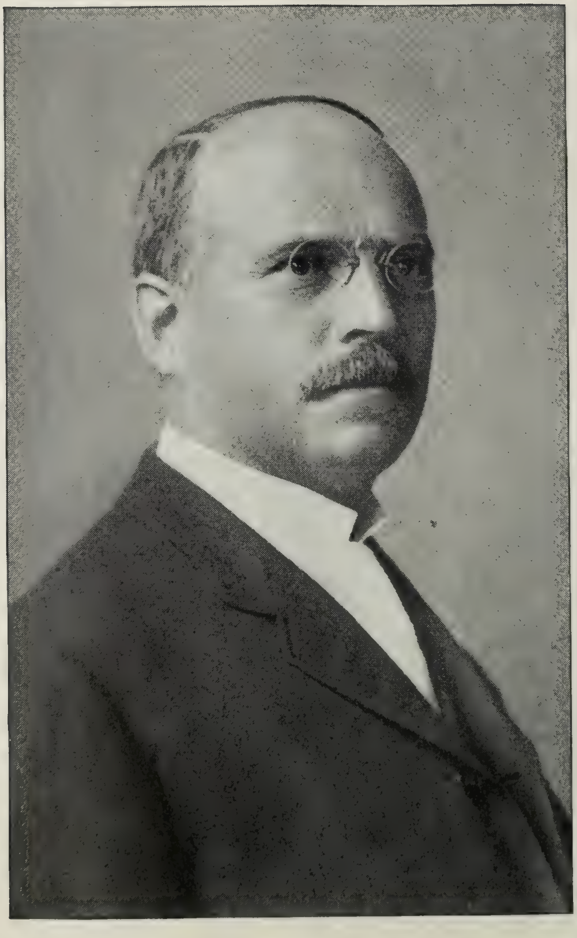


Rud. H. Hofheinz

THE

DENTAL COSMOS

VOL. LIX. JANUARY 1917. No. 1.

ORIGINAL COMMUNICATIONS

Technique of Injecting the Gasserian Ganglion with Alcohol for Tic Douloureux.

By GEO. MORRIS DORRANCE, M.D., Philadelphia, Pa.

(Read before the Academy of Stomatology of Philadelphia, October 24, 1916.)

REALIZING all too well that the literature on the subject of tic douloureux is already voluminous, one has felt that a correlation of all our present knowledge, with a brief historical note on the various phases of the treatment in its evolution to the present time, would not be amiss.

The disease has been recognized from the earliest times, but knowledge of the anatomy of the parts and logical study of the condition is comparatively recent.

Fallopius was the first to discover that the fifth nerve was divided into three peripheral portions. Meckel and Vieussens observed a flattened structure at the point of division, but not until 1765 was the ganglion recognized. This was due to the work of Raimond Balthasar Hirsch, a student of Johannathon Gasser, and it was in honor of his teacher that the ganglion received its name. From this time on, the real study of the diagnosis, pathology, and treatment began. Fothergill, about 1716, is supposed to have described the first case of tic douloureux.

CLASSIFICATION.

Tic douloureux has been divided by various authors into many different types and varieties, but the one at present accepted is the simple division of minor and major, recognized by such men as Osler, Patrick, and Frazier.

The minor variety includes all cases of simple neuralgia, commonly due to some local irritation or trauma of the peripheral nerve. In these cases a cause can as a rule be found, and removal of the cause gives relief, provided it be done early. Neglected minor cases extending over a long period of time, even after the original cause has been found and corrected, often continue, and to all intents and purposes become major.

In the true major variety, so-called idiopathic, no cause can be found. The patient complains of a stab-like pain, as a rule confined to one spot, and for a long time in only one division of the fifth nerve. Later, of course, other branches may become involved, and the disease shows all the well-known characteristics of tic douloureux.

Among the various conditions which have been assigned as playing an important part either as a predisposing factor or even the actual cause of the neuralgia are the following:

(1) Infectious diseases.
(2) Influenza, etc.
(3) Anemia.
(4) Congestion.
(5) Primary neuritis.
(6) High altitudes.
(7) Drafts.
(8) Nasal and sinus disease.
(9) Carious teeth; Riggs' disease.
(10) Apical abscesses.
(11) Heredity.
(12) Rheumatism.
(13) Trauma.
(14) Digestive disturbances.
(15) Occupation.
(16) Alcohol and narcotic drugs.
(17) Arterio-sclerosis.

From this wide range of predisposing factors, one can readily select one which any patient suffering from tic douloureux might admit having experienced. As a matter of fact, up to the present time we are still groping for the cause of tic douloureux, but we feel justified in believing that more than one factor plays an important part in bringing on the disease.

DIAGNOSIS.

The most important of all symptoms is pain, which is short and sharp. At the beginning of the disease it is very short, only a flash, later it is stab-like in character. The intervals between the paroxysms are from one or two seconds to weeks or months; as the case becomes more fully developed they last for one or two minutes, with the intervals growing shorter and shorter until the pain appears to be almost continuous. The slightest peripheral irritation starts the pain, *e.g.* washing the face, etc. The pain can as a rule be started by slightly wiping a wisp of cotton over the face. Irritation in one division of the nerve often starts pain in another. The disease has characteristic remissions, often for weeks or months. Diseases from which it must be differentiated are—

(1) Migraine.
(2) Sinus diseases.
(3) Alveolar abscess.
(4) Carious teeth with exposed nerves.
(5) Abscess at roots of teeth.
(6) Herpes zoster.
(7) Hysteria.
(8) Brain tumors.
(9) Disease of optic thalamus.

As none of these conditions have the characteristic variations as described in connection with tic douloureux, one is not likely to make a mistake in the diagnosis if he has these facts in mind and goes over the history of the case carefully, paying particular attention to the diseases just enumerated.

SURGICAL ANATOMY OF THE GASSERIAN GANGLION.

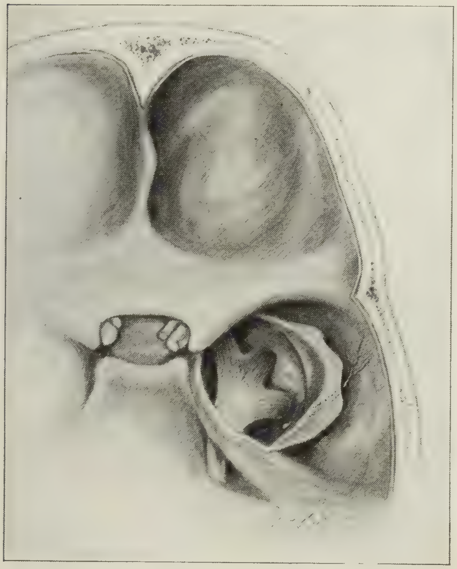
The ganglion is situated at the apex of the middle fossa of the skull, opposite the mid-point of the zygoma, at any distance from 5 to 7 cm. in depth. The depression in the bony wall in which the ganglion is located is an indentation at the apex of the petrous portion of the temporal bone, called Meckel's cave. (See Fig. 1.)

The most important structures of the middle fossa are the temporo-sphenoidal lobe of the brain, the dura mater, and the middle meningeal artery. The dura mater at the region of the petrosal apex separates into two layers, in order to ensheathe the Gasserian ganglion. The peculiarities of the attachment must be known to enable one to perform a successful enucleation. The layer of dura mater separating the brain from the ganglion is very adherent to the superior surface of the ganglion. Beneath the ganglion the dura is firmly attached to the bone and the margin of the anterior foramen lacerum, the foramen rotundum, the foramen ovale, and the foramen spinosum. The dura mater is again firmly attached to the inner border of the ganglion, because of its intimate relation with the carotid artery and the cavernous sinus.

Next important to consider in the

middle fossa is the middle meningeal artery. Normally the artery begins behind the ganglion. Coming through the foramen spinosum it makes a short, gentle curve backward, and becomes enveloped by the dura mater. It then courses outward, following the concavity of the floor in the middle fossa until it reaches the lower anterior angle of the parietal bone, which the artery enters either in a deep groove or an incomplete bony canal. Its length varies from 3 to 6.5 cm.

FIG. 1.



Gasserian ganglion and middle meningeal artery.

Briefly speaking, the fifth cranial nerve, by means of the Gasserian ganglion, controls either altogether or partly the sensory innervation of the eye, the skin of the face, the teeth, and the mucous membrane of the nose and mouth. A large number of reflexes reach the brain along these routes. When these reflexes become painful we call it neuralgia, and endeavor to inhibit them—and failing in this, we either remove the ganglion or section its sensory root—first, however, giving the alcoholic injection a fair trial.

DISTRIBUTION AT THE FIFTH CRANIAL NERVE.

Beginning at the ganglion, we observe that first each division gives off a branch inside the cranium, and secondly each of these roots contributes a small branch to enter into the formation of a new ganglion, *e.g.* ciliary, Meckel's, otic, etc. Another division of these ganglia is derived from the sympathetic system, with which new ganglia bring the fifth nerve into communication, thus furnishing a prolific source for reflexes to be brought from distant parts to the fifth nerve.

The auditory sends a branch to the geniculate ganglion of the facial nerve, and the latter is in communication with the branches of the fifth. Each main division makes its appearance through a distinct foramen, and reigns over a definite area. If the terminal filaments of the three nerve trunks were traced over the face, they would be found to cover the entire area with the exception of the ears and the lower mandibular angles.

The three bony foramina through which the nerve trunks reach the face are known respectively from above downward as the supra-orbital, infra-orbital, and mental, the nerves passing through them having similar nomenclature.

These foramina lie in a straight line (vertical) drawn downward from the supra-orbital foramen to the space between the two bicuspids. This line crosses both the infra-orbital and mental foramina. Since all these superficial foramina are palpable on the face and only one-half inch distant from the surface, it is quite easy to inject them, but since these superficial injections in the majority of cases have failed, the supra-orbital foramen is at the present time practically the only one injected.

THE COURSE OF TIC DOULOUREUX.

Before considering the types of treatment, it might be well to say a few words with regard to the course of tic douloureux with or without treatment.

Dr. Charles S. Dana, in the *Journal of the American Medical Association,* in

1900, presented a paper on "The Natural History of Tic Douloureux," in which he reports 50 cases of tic douloureux which he had followed from five to fifteen years, and in all of which he knew the history of the disease from its onset. After describing various types of the affection he comes to the following conclusion: "Tic douloureux has as one of its characteristic features a tendency to remissions. These can be artificially produced by various drugs and treatments."

We have found many other authors who have expressed the same opinion, and we are inclined from a study of our cases to agree with him. Knowing this, one can readily understand why various drugs and forms of treatment have been thought successful, and also understand why many cases have been reported as cured by medication which could not by any possible chance have exerted any influence on the course of the disease.

MEDICAL TREATMENT.

Among the drugs which have been used with benefit we have selected those which have been tried with apparent success by many.

Before any treatment is begun a careful search for the cause is made, and if found, removed. This means a complete physical examination with all laboratory aids.

In making the examination one should pay special attention to the eyes; examine carefully the nose and sinuses by indirect illumination. The teeth should be carefully inspected by a competent dentist. No examination is complete without X-ray pictures of the head. In two cases we have found broken broaches left in the canals of the teeth.

A blood count is always necessary and a Wassermann test is essential. Urine analysis is part and parcel of the routine examination.

If the medicinal treatment is to be tried, the patient is instructed to have complete rest, in bed if possible, for a time. The general health is toned up and the diet regulated to suit the case.

Administration of strychnin, beginning with $\frac{1}{30}$ of a grain t.i.d., and increasing the dose until $\frac{1}{4}$ of a grain is being taken daily or until the patient begins to show symptoms of strychnin poisoning, is advocated by such men as Graham, Hammond, Dana, and Keller. This treatment at the present time has many advocates.

In 1900, Drs. Moyer, Ochsner, and Patrick advocated the use of castor-oil ʒj to ʒij every morning, and each reports a number of successful results. This method was first suggested by Gussenbauer of Germany, and while all agree that its efficacy is not due to the laxative action, no therapeutic reason has been advanced. Dr. Naper of Edinburgh uses quinin and arsenic. Dr. C. Vinay of Lyons advocates the method suggested by Dehove of London in 1885 of spraying methyl chlorid over the painful areas, and reports very favorable results.

We might continue almost indefinitely naming various drugs and combinations of drugs which in turn have been looked upon as specific, but the general consensus of opinion at the present day is that medical treatment in the vast majority of cases is a failure.

PHYSICAL TREATMENT.

Under this heading comes nerve-stretching, massage, all forms of electrical and X-ray treatments, etc.

Professor Baum in 1876 was the first to stretch the facial nerve. The first case recorded of nerve-stretching for the relief of neuralgia was in 1872, when Professor Nussbaum demonstrated several cases in his clinic. The method gained many admirers, and in 1883 had reached its height. Dr. John Marshall, president of the Royal College of Surgeons, London, at that date used this method as his theme in his inaugural address. The theory of the treatment is that the epineural fibers, perineum, and tubules are stretched into straight lines, the fasciculi compressed, and if long continued the axis cylinder gives way. A nerve will stretch 1/24 of its length, but will recoil 1/40 of its original length after the strain has been removed. Following a stretching all adhesions are destroyed, slight degeneration occurs, and the sheath becomes infiltrated.

In case of tic douloureux the nerve which is the seat of neuralgia is exposed and stretched. Since an exposure needs to be made, many remove sections or inject the nerve trunk with osmic acid or alcohol. While this method is applicable in some cases of sciatica, its field is mostly limited to tic douloureux.

In the *Revista de Méd. y Cir.*, Havana, several cases of severe facial neuralgia have been reported cured by a few séances of galvanization with the positive pole applied to the painful region. The galvanic current is recommended and a number of cases have been reported as entirely cured. Professor Brugus of Berlin reports as the results obtained in his hydro-therapeutic institute 80 per cent. of cases of neuralgia cured. Professor Scheeling, Berlin, reports good results from the use of Bier's hyperemia.

Nearly all radiologists claim benefits from the X-ray in cases of neuralgia. Hanerf is enthusiastic in the use of the X-ray, and reports its use in cases of over two years' standing, with no recurrence.

Professor Bier recommends hot air in the treatment of neuralgia. F. Savary Pearce of Milwaukee claims to have cured two cases by inducing the patients to live in a climate of low altitude. Dr. L. Pierce Clark recommends, as a temporary relief from all forms of neuralgia, a treatment with LeDuc current.

SURGICAL TREATMENT.

Resection of the nerve. Next in order comes the surgical treatment, and here we have many varieties of operations and injections. Cruickshank was the first to prove that section of a nerve trunk did not cause permanent paralysis of the parts supplied. The observations of Warren and Velpeau in 1830, and later those of Sir Astley Cooper, showing that resection of a nerve was often attended with satisfactory results, paved the way for the first real surgical treatment of tic douloureux. From 1830 to 1840 a large number of resections of nerves for the cure of trifacial neuralgia were performed. The results were encouraging for a time, but recurrence of the neuralgia was the invariable rule. From 1840 to 1852 scarcely any sections of nerves were made for neuralgia. Logenbleck was the first to resect the second branch of the trigeminal nerve on the floor of the orbit. In 1858 John M. Carnochan published his paper in the *American Journal of Medical Sciences,* advancing the idea that the real seat of the disease was in the trunk of the nerve in front of the foramen rotundum. He said, "I believe the real key of the operation is in the removal of Meckel's ganglion or its insulation from the encephalon. Because of the gray matter in the ganglion, impulses are formed and discharged from here along the branches." From that time his operation or a modification of it was the one of choice, until gasserectomy was attempted.

Ligation of carotid artery. Nothing new appeared in the form of treatment of tic douloureux until 1862, when Truneau published his paper on the ligation of the common carotid as a means of treatment. Truneau, however, gives credit to Nussbaum for being the first to perform this operation.

This means of treatment does not appear to have become very popular, for in 1897 B. Merrill Rickets of Cincinnati (*Journal of American Medical Association,* October 16, 1897) could only find eighteen cases reported in the literature. Of these, nine cases were reported as having been cured.

Avulsion of nerve. Thiersch suggested avulsion of the branches of the nerve with blunt forceps after anatomical exposure. In 1884 Dr. F. Chawrse Charvise, writing in the London *Lancet,* gave a summary of all cases of neurectomy where the nerve was traced back to foramina of exit, and found twenty-four cases reported. In 1887 Sulzer of

Vienna and Horsley of London favored avulsion. In 1889 the Carnochan operation, although considerably modified by Luche, Braun, and Larsen, was still considered dangerous, and the scar resulting therefrom was hideous. Frankel of Vienna further modified this operation, making his incision from the inside and following somewhat the operation of Caldwell for opening the antrum in the treatment of empyema. For a time this appeared to be the final operation for the relief of tic douloureux. However, recurrences led to the suggestion of plugging the canals with some material to prevent the severed ends of the nerves from uniting. C. H. Mayo used silver screws; Kanavel, bone grafts; Moschovitz, N. Y., silver buttons, but despite these means there were recurrences, and surgeons looked further for some operative procedure which could be depended upon in all cases of tic douloureux.

Removal of Gasserian ganglion. Dr. J. Ewing Mears of Philadelphia was the first to propose the removal of the Gasserian ganglion, and Dr. Rose of London was the first surgeon to attempt it, although Andrews of Chicago had been working for eighteen months on such an operation. Rose performed his operation for the excision of the ganglion in 1890, just one hundred and twenty-five years after Raimond Balthasar Hirsch had described it. The method of Rose—named after its originator—did not last long, because of the seriousness of the operation, but it stimulated the work on the subject, and a new method of approach was sought by all, as it was next to impossible to remove all of the ganglion by the so-called pterygoid route.

In 1892 Frank Hartley used the horseshoe shaped or omega incision with its base at the zygoma. He says he saw a description of this incision three years before by Uhle. In the same year Dr. Krause, working independently, used the same idea, hence the operation is generally known as the Hartley-Krause method. Dr. Keen performed his first operation for the excision of the ganglion in 1891. Cushing appears to have taken suggestions from the Hartley-Krause operation and the modifications thereof by Doyen and Possier and perfected an operation which appears to be the one of choice where the ganglion is excised. The final word on cases of tic douloureux where excision of the ganglion—intra-cranial operation—is contemplated is the operation suggested by Spiller and worked out by Frazier, *i.e.* removal of the posterior roots of the ganglion.

Despite the fact that this operation has never had a recurrence when properly performed, many surgeons favor some less radical procedure. With this idea in view, Dr. Abbe perfected his technique, and favors this method in the treatment of tic douloureux. We quote from his paper in the *Journal of the American Medical Association,* May 15, 1910: "Because of the fact that if pain is central, peripheral operation is useless, and if peripheral, a large resection of nerve is necessary, and some effort must be made to prevent regeneration"—he devised his method of resecting the intra-cranial portion of the second and third branches, and to prevent the stumps in the canal from regenerating with the torn ganglion he interposed gutta-percha tissue over both foramina under the ganglion. He has had no recurrences after four years, and he advises his operation as the one of choice, unless a tumor of the ganglion be present.

Destruction of nerve by actual cautery. In the *Journal of the American Medical Association* for May 2, 1908, we find only 17 cases reported, all successful after intervals of from two to nine years after operation following the technique of Tansani. His method in brief is to destroy the nerve by actual cautery, the needle being inserted as far as possible into the foramen of exit of the nerve. He claims that the process that follows the thermo-cauterization and consecutive regeneration alters the structure of the nerve so that sensory impulses become impossible. He uses the ordinary strength of current for from five to ten seconds, and all nerves involved are treated at a single sitting.

Summing up the surgery of the Gasserian ganglion, the operations that are in favor at the present time are five, each having its admirers. They are (1) Hartley-Krause's, (2) Horsley's, (3) Kocher's, (4) Abbe's, (5) Frazier-Spiller's.

With regard to the mortality of the intra-cranial operations, in a series of 230 cases from Horsley, Lexer, Dollinger, Cushing, and Frazier, the mortality is 3.7 per cent. Frazier's mortality is 3.6 per cent.

INJECTION METHODS.

The first impetus given to injection of chemicals into nerves came about in 1884, when Neuber of Esmarch's clinic reported a case of sciatica and trigeminal neuralgia treated with osmic acid. In the same year Eulenberg reported three cures and four cases benefited, and in 1885 Jacobi of New York reported eight cases treated with the same drug. Bennett and later Murphy advocated the method, but recurrences stimulated others to find some substance or some method that would make cures permanent. Morphin, strychnin, hyoscyamin, aconite, and curara had been tried, but proved ineffective. G. Sluder in 1911 injected 5 per cent. phenol in alcohol into the sphenopalatine ganglion; he introduced a straight needle from in front backward and upward under the posterior tip of the turbinate for a distance of from 5 to 6 cm. He reports many successes in cases where other injections had failed. Hammerschlag advises that injections of 1 per cent. osmic acid be made into the infra-orbital and mental foramina.

Wright in 1904 was the first to inject the Gasserian ganglion with osmic acid. He exposed the ganglion by making an incision from above the zygoma downward and coming forward along the lower border of the jaw. The zygoma was dissected and turned down, the coronoid process was divided and turned up, a curved dental syringe being used to inject 2 per cent. osmic acid into the ganglion through the foramen. The nerves were torn away and the wound closed. The results reported were good, but the operation is a serious one, and the resulting scar is one of the features which make it objectionable.

VARIOUS METHODS OF INJECTING ALCOHOL.

Rasoumowsky in 1910 was the first to infiltrate the exposed ganglion with alcohol. In 1903 Schlosser, an ophthalmologist of Munich, published his work on the injection of alcohol into the nerves for the relief of tic douloureux. He was the first to suggest the use of alcohol in tic douloureux, although it had been used previously to check facial spasms. To make sure that the injection reaches the nerve affected with neuralgia, Schlosser injects into the foramina through which the respective branches emerge on the face, viz, for the first branch, the supra-orbital; for the second, the infra-orbital; for the third, the interdental. For this purpose he has devised a set of syringe needles the edges of which do not cut at the point, hence there is no injury to the vessels on inserting the needle.

For an injection into the supra-orbital foramen, the needle is pushed sagitally along the sometimes not very well defined foramen. It must not penetrate the periosteum of the orbit on account of the danger of producing retrobulbar edema. The peripheral infra-orbital injection is free from difficulty or danger. Injection into the inferior dental foramen gives rise to masseteric and pterygoid spasm resembling a mild trismus, which disappears in a week or so. Sicard and Ostwalt were the first to suggest the indirect injection of the ganglion by Schlosser's route. The deep injection at the foramen ovale is made as follows: Having first introduced the finger into the mouth at the back of the last molar as a guide, the longest of the needles is forced through the cheek under the periosteum to the pterygoid plate, and upward on it until about 2¼ inches of the needle is buried. Lowering the handle of the needle admits of advancing the point one-quarter of an inch toward the base, where it is definitely arrested. Then, deftly feeling backward, and keeping close to the bone for about three-eighths of an inch, one feels the needle enter the foramen ovale, and the injection is begun. Narcosis is hardly ever necessary. Later, Levy and Baudoin perfected a method which most authorities agree is easier of application and superior to Schlosser's. Patrick uses this method with slight modification and in his last paper gives the following directions for reaching the branches:

> [*Superior maxillary division.*] The line of the posterior border of the ascending (orbital) process of the malar bone is prolonged to the border of the zygoma, and the needle is inserted 0.5 cm. posterior to this point. It is directed vertically to the antero-posterior line, but inclined slightly upward in a direction which would attain at the depth of the foramen rotundum the level of the inferior extremity of the nasal bone. At a depth of 5 cm. the nerve is reached at its emergence from the foramen rotundum in the pterygo-maxillary fossa. For the third or mandibular division, the needle is inserted in the sigmoid notch 2.5 cm. in front of the descending root of the zygoma. It is pushed straight in, keeping close to the base of the skull. The nerve is reached from its point of exit from the skull at a depth of about 4 cm., as a rule.

Opperhaus in 1910 worked out a method of locating the foramen ovale by measurement. He made a study of fifty skulls, and found that "the distance measured from the outside behind the last molar tooth nearly corresponds to the distance between the two foramina ovale, so that if the length of the distance between the alveolar process behind the last molar tooth of the upper jaw be deducted from the length of a line between the articular tubercles on either zygoma, and that divided by 2, the result will give the approximate depth of the foramen ovale from the articular tubercle of the corresponding side." (Maes. *Surgery, Gynecology, and Obstetrics,* October 1915.) The average depth was found to be from 3.7 to 4.3 cm.

Harris, Hecht, and Ostwalt have somewhat modified these methods, and each claims a given advantage for his method.

TECHNIQUE OF THE HARTEL METHOD, THE METHOD PREFERRED BY THE AUTHOR.

The final step in alcoholic injections was made when Hartel published his article on the injection of alcohol into the Gasserian ganglion. He was not the first to do this, however, as Harris of London had in 1910 approached the ganglion by Schlosser's route. The suggestion for alcoholic injection of the ganglion by the indirect method comes from Sicard. Since Hartel's method appears to us to be the best, we have abstracted his communication in *Deutsch. Zeitschr. f. Chir.,* cxxvi, Nos. 5 and 6, and give herewith the essential steps. The injection must be made at a clinic. The patient must remain in the hospital at least two days after the operation. Ambulatory treatment leads to corneal ulcers.

Preparation of the patient. An injection of morphin or of pantopon one-half hour before the injection secures the quietude of the patient during the operation. The usual aseptic precautions should be taken.

Instruments needed. Cannula for infiltration anesthesia; several razor cannulas; cannulas 10 cm. long and 8 mm. in breadth, with smoothly ground-off point; two recording syringes holding 5 cc.; glass rod for testing the corneal reflexes, needle, and pinching forceps for testing the anesthesia: one-half to one per cent. novocain solution for skin anesthesia; 2 per cent. novocain solution in ampules for the ganglion anesthesia; 70 per cent. to 80 per cent. alcohol of chemically pure character (not the ordinary 70 per cent. alcohol, which contains impure constituents) in sterile cups. According to Hartel's experience, it makes little difference whether 70 per cent. or 80 per cent. or concentrated alcohol is used. It is true that, according to Frey, alcohol possesses most albumin-destroying properties when it is 70 per cent., but it certainly undergoes a dilution in the tissues, and is still further diluted by the novocain solution.

ANESTHESIA.

We generally use local anesthesia. In very much agitated patients, Braun does the operation during narcosis. We sometimes use a slight pantopon-ether narcosis, which diminishes the pain without causing the reflexes to disappear. Of course one must be sure of his technique, and be able to depend on the patient's subjective statements. In repeated injections the cornea should be protected from the ether vapor by a watch-glass and bandage.

OPERATION.

The puncture. An assistant fixes the head of the patient; the guard of the ganglion cannula is fixed at 6 cm. from the point; with the left index finger the operator feels in the patient's closed mouth cavity the narrow passage between the coronoid process and the tubercle maxillæ. The cannula is introduced into the cheek at a point opposite the second molar, and with the guidance of the left index finger is directed subcutaneously between the mandible and the tubercle maxillæ directly upward until it meets with the hard and smooth resistance of the sphenoid bone. The finger may now be removed from the mouth. It should be remembered that the needle is now inserted to a depth of about 4 cm. Before any further manipulations are made it is necessary to keep in mind the fact that a line drawn vertically upward from the point of entrance of the needle into the skin will bisect the pupil of the eye if looked at from in front, while if looked at from the side it will bisect the articular eminence of the zygoma. If these rules are carefully followed the rest of the procedure will be greatly simplified. The needle is now pushed backward and slightly upward, the operation becoming more painful, indicating that the needle is getting into the neighborhood of the third branch and its twigs. After several tentative feelings with the cannula, the resistance suddenly ceases, which indicates penetration into the skull through the foramen ovale. Bony resistance is no longer felt, but instead, what is quite characteristic on long practice, the elastic resistance of ganglionic tissue. If, however, bony resistance be met with, one may be in the foramen ovale, but in a false axis, or may have passed beyond the foramen ovale and approached the lower surface of the temporal bone (Eustachian tube). The cannula is then taken out and the puncture repeated from an altered axis—change of the point of entrance—until the goal is reached.

The subjective statements of the patients vary greatly; some do not experience pain; others complain of parasthesia only; others complain of very severe pain that must be combated by the use of novocain. Only three-fourths of the patients can give exact statements as to the location of the pain at the painful moment.

In cases that have previously received alcoholic injections or in whom fibrous alterations at the base of the brain exist, no bony surface is felt, but a scar stratum is encountered, penetration of which gives rise to pain, and renders further palpation along the bone very difficult. In these cases the goal is reached by depending exclusively on the direction—pupils; articular tuberculi. If under these conditions bone be met with, the needle should be withdrawn and the puncture repeated with strict attention to the direction, until the typical localizing expression of pain is elicited at the cranial depth. A trial novocain injection will now determine whether or not the ganglion has been reached.

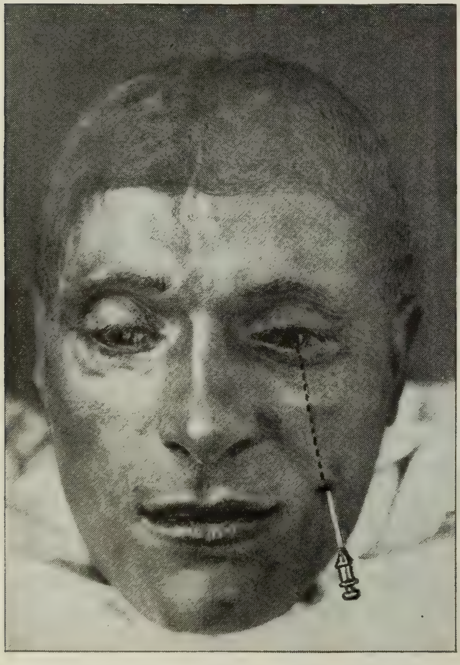
THE TRIAL NOVOCAIN INJECTION.

After the cannula has been introduced to the required depth, about 6 to 6.5 cm., we inject from $\frac{1}{4}$ to $\frac{1}{2}$ cc. of 2 per cent. novocain solution. Immediately or in a few minutes the corneal reflex is lost, and there is analgesia in the region of the whole trigeminus distribution, if the ganglion has been reached. If this action does not follow promptly we should repeat the injection at a different depth, or even repeat the puncture. In case of a successful novocain injection, it is followed immediately with the alcoholic injection.

THE ALCOHOL INJECTION.

The alcohol is injected drop by drop in very small showers, with close attention to the eye movements of the patient and his subjective statements. After the injection of each drop, the cannula is moved from side to side in order to come in contact with as much of the ganglion as possible, 2 cc. of alcohol being used, as a rule. (See Fig. 2.)

Fig. 2.



Note line bisecting pupil of the eye when viewed in front. In all our later cases this line was drawn out on the face before inserting the needle.

After the injection is completed the cannula is rapidly withdrawn, and the puncture is covered with a small collodion dressing. Slight hematoma, later producing discolorations, may occur, which clears up in a few days. The eyes are flushed with boric acid solution and covered with watch-glass crystals surrounded by felt rings acting as cushions. The felt rings must be fastened inwardly by adhesive plaster, in order to prevent the fibers of felt from entering the eye.

AFTER-TREATMENT.

The patient should have complete rest, with no occupation such as reading, writing, etc. If there is much secretion the eyes are washed twice daily with boric acid solution or physiological salt solution. The watch-glasses are replaced after eight days by a pair of automobile goggles. In case conjunctival irritation occurs, the watch-glasses should be replaced and atropin used until its physiological effect is produced. The anesthesia should be tested daily. If sensation returns after several days the injection should be repeated, even if the patient has no pain, until there is complete permanent anesthesia against the prick of a needle, and against touch in the entire territory of the trigemina or at least in the territory supplied by the affected branches. (See Figs. 3 and 4.)

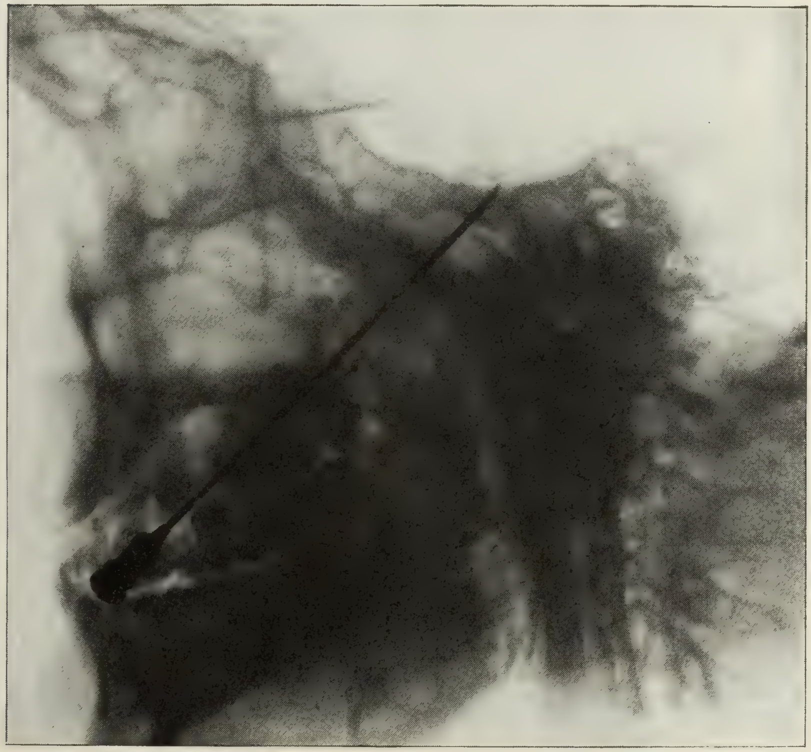
REPORT OF A SERIES OF EXPERIMENTS ON CADAVERS.

Because of the fact that we advocate the method of Hartel, and feel that it offers the greatest hope in the treatment of tic douloureux, we made a long series of experiments on cadavers in the dissecting-room, using methylene blue as our medium, and injected a series of over 210 cases. In all cases both sides were injected, and we have had at least 420 chances for observation. The injections were made following the directions laid down by Hartel; the calvarium was removed, affording the opportunity of seeing our results. It was found that one could disregard the second molar as a guide and substitute instead the following: Measure 2 cm. from the angle of the mouth on the side to be injected, and at a point $\frac{1}{2}$ cm. above this insert the needle. When this method was adopted we failed to reach the ganglion in but one instance. It was found that the depth required for penetrating the ganglion varied greatly with each skull, and no external measures which we could devise appeared to help us. The shortest distance from where the needle bisected the ganglion was 3.75 cm., the cadaver in question being that of an old woman of uncertain age; the greatest distance, curiously enough, was on another old woman apparently just as thin and emaciated-looking. Here the needle was inserted 7 cm. The average distance in 420 injections was 6.4 cm. In one case, after dissection was made of the ganglion it was found that a small vein posterior to the ganglion had been penetrated by the needle.

In order to determine what the danger would be of penetrating the middle meningeal artery at the foramen spinosum, a number of measurements were made at the Wister Institute of Anatomy, through the courtesy of Dr. Greenman. By means of calipers the distance between the foramen ovale and spinosum was measured in 32 skulls. In one case the canals communicated; in another the foramen spinosum was absent. The greatest distance found between the foramina was 0.5 cm. and the average was 0.2 cm. In none of the cases injected was the artery penetrated.

In every case injected, the rules laid

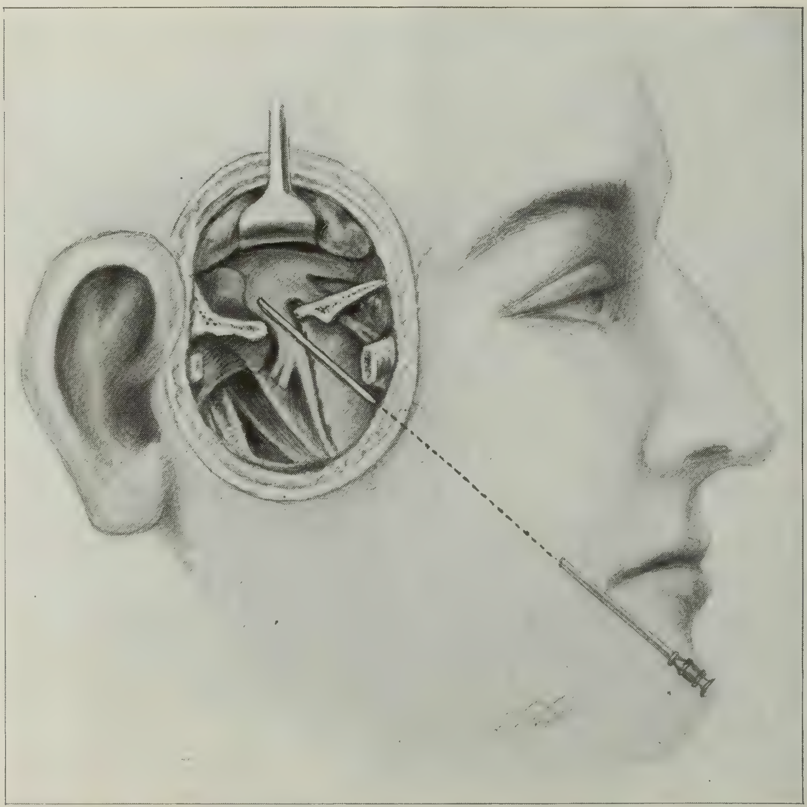
Fig. 3.



Radiogram showing needle in proper position.

down by Hartel were followed, *i.e.* that when the needle is in the foramen ovale a vertical line dropped from the pupil of the eye will pass through the needle, the prolongation of the needle will bisect the pupil of the eye if viewed from the front, and the articular eminence of the zygoma when viewed from the side.

Fig. 4.



Needle in ganglion.

Wherever these guide lines were disregarded the procedure became much more difficult, and the results less accurate. (See Fig. 5.)

CONCLUSIONS ON THE TREATMENT OF TIC DOULOUREUX.

(1) In all true cases of tic douloureux, if seen early and only the supra-orbital branch is involved and it is known to be peripheral, the nerve is to be injected at the supra-orbital foramen. This will give relief in a limited number of cases. If this fail, the deep injection is not advocated, but injection of the ganglion by the Hartel method. Before resorting to the ganglionic injections in some few cases, the removal of the peripheral nerve by the method of Thiersch is indicated.

(2) Where the third division alone is involved, the nerve is injected as it leaves the foramen, using Hartel's lines. In all other cases, the ganglion is injected.

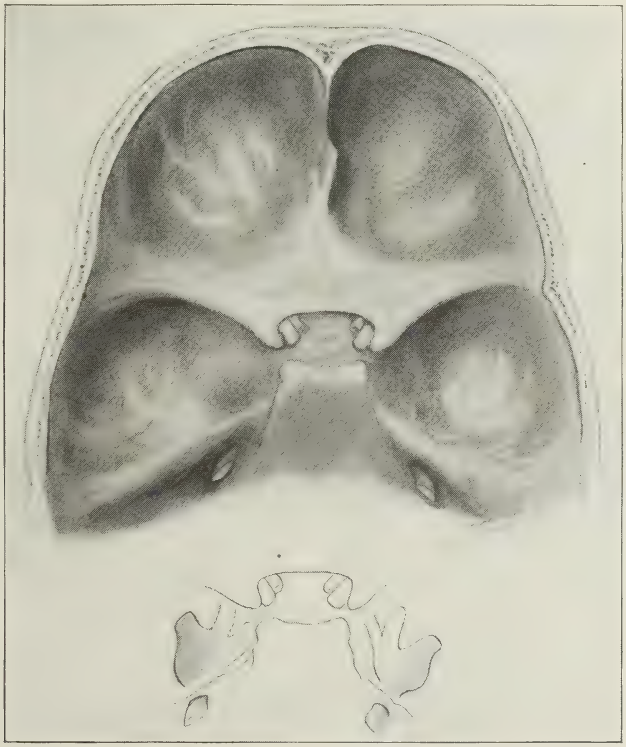
(3) In cases where repeated intraganglionic injections have failed to give relief, or in cases where some anomaly occurs which prevents an approach

through the foramen ovale, the operation of Frazier or Cushing is advised.

(4) Secondary neuralgias are treated according to their etiological factors, alcohol injections being used only in cases of inoperable tumors which are causing severe neuralgic pain.

(5) The rules advocated by Hartel are practically essential to success.

Fig. 5.



Sketch made from cadaver. On the left side the ganglion was well injected with methylene blue, whereas on the right side it was only partially infiltrated.

Because of the many cases reported as having recurred in a very short time following intra-ganglionic injections, the position of the needle was examined after having made an injection, as well as the subsequent distribution of the injected material, in order to find a cause for the failures, if possible. Our conclusions were that the failures were due either to the fact that (*a*) the needle passed under the ganglion in the dura and the injected material only partially infiltrated the ganglionic cells or that (*b*) the needle went to a point midway between the ganglion and the dura; here methylene blue failed to stain the cells at all.

It is of course to be remembered that in the cadaver the ganglion is shrunken. Nevertheless, what occurs here might possibly occur in a patient, and confuse the results. It was likewise observed that in cases where the needle was withdrawn and reinserted (needle not withdrawn from foramen ovale) at different points into the ganglion, the entire collection of cells was stained, whereas with one injection a large part of the ganglion was missed.

DANGERS IN INJECTION OF GANGLION.

(1) Great care must be exercised in the care of the needle; it should be carefully tested before the injection, as we have had the experience—on the cadaver—of having had one break during an injection.

(2) Puncture of the internal maxillary artery is possible, but very rare.

(3) If in inserting the needle one feels it strike the base of the sphenoidal bone and the point is depressed, it has come in contact with a rough surface. This means that we are below the foramen, and if the injection is made at that point the fluid passes into the Eustachian tube. In every case before an injection is made, a study of the position of the shaft of the needle must be made as laid down in Hartel's rules. Never inject when the needle is pointed below the tubercle of the zygoma, and in this position do not insert beyond 5.75 cm., because of the danger of puncturing the jugular vein.

EFFECT OF THE ALCOHOL INJECTION ON THE NERVE TISSUES.

As to what occurs to nerves or ganglia after alcohol is injected, Schlosser claims that a degeneration takes place and continues after repeated injections, until only the neurilemma remains. Cadwalader and Essembrey, from their experiments in injecting the different strengths of alcohol into the peripheral nerves, concluded that alcohol destroys tissue by dissolution, coagulating albuminous material and dissolving lipoids.

Alfred Gordon in 1913, after a series of experiments with 80 per cent. alcohol injected into the nerves, concludes that in the sensory or mixed nerves the histological changes are very conspicuous, not only nine days after the injections but also after twenty days, and that not only the nerve bundles but their respective ganglia also show distinct degenerative changes.

Otto May, London, in a paper in the *Journal of the American Medical Association*, August 1912, on the "Effects of Intra-cranial and Intra-ganglionic Injections of Alcohol" (cats used in every case except one, where a goat was substituted), came to the following conclusions:

(1) Alcohol injected into the trunk of a peripheral nerve produces a more or less complete local necrosis of the nerve at the point of injection.

(2) The change is not an ascending one, the nerve above the point of injection remaining normal. The cells of origin of the fibers may show some degrees of chromatolysis, but do not exhibit signs of permanent injury.

(3) The conditions produced by such injections are more favorable to regeneration than those resulting from simple section. The anatomical continuity of the nerve trunk favors rapid regeneration, though this is to some extent retarded by the fibrins which occur to a greater or less extent in every case of alcohol injection.

(4) It is apparently impossible by a single injection of alcohol to produce complete necrosis of the Gasserian ganglion, its dense texture preventing diffusion of fluids. The alcohol tends to find its way under the sheath of the ganglion toward the approximal root, which is affected to a greater degree than the actual ganglionic cells.

Dr. Gordon objected to the above conclusions because of the varying degrees of the alcohol used, and the fact that the depth of the penetration of the needle varied in different cases. One case is cited where no effect occurred after the injection, and the conclusion is drawn that the needle went through the nerve before the alcohol was injected. The same may account for no result being obtained in some clinical cases. From a limited number of experiments which we performed, we are inclined to agree with May in most particulars.

A systematic study of the changes which occur from the injection of 80 per cent. alcohol into fat, fascia, and muscles was next begun, with the idea of noting the changes in the tissues around the nerves. Mention of these will be made in a subsequent article on the treatment of facial spasm by alcoholic injection. It suffices to state here that in all superficial injections of alcohol a distinct necrosis of the fatty tissues occurs, and if large amounts be injected a distinct slough follows. We are unable to find any changes following the deep injection other than those of a mild irritation.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

Co-operative Organization in Dental and Oral Surgical Practice, Especially in the Diagnosis and Elimination of Chronic Mouth Infection as a Factor in Systemic Disease.

By ROBERT H. IVY, M.D., D.D.S., Milwaukee, Wis.

(Read before the Susquehanna Dental Association, Scranton, Pa., May 16, 1916.)

SPECIALIZATION in medicine has reached a high degree of development; the leaders in the profession are nearly all specialists. Furthermore, of late years the different specialties have become subdivided, and in large cities there are men who devote themselves exclusively to these subdivisions.

In dentistry the same tendency is being manifested. While the great majority of dentists even in large cities conduct general practices, yet the tendency toward restriction to one particular branch of dentistry is becoming more and more apparent, as it is realized that a detailed practical knowledge of the whole field is beyond the capacity of one individual.

ADVANTAGES AND DISADVANTAGES OF THE CO-OPERATIVE PLAN.

While specialization both in medicine and in dentistry has been the principal factor in increasing the efficiency of practice in the individual branches, yet there are certain disadvantages for both patient and practitioner in having the case pass through the hands of several men. Each specialist is apt to have his mind fixed only upon the part of the work he is undertaking, perhaps attributing undue importance to it, and to lose sight of the point of view of the case as a whole, so that by the time the patient has passed through the hands of the last specialist, the original reason for consultation may have been forgotten. Perhaps the point which most forcibly strikes the patient is the increased expense entailed in consulting several different men. In order to overcome the disadvantages of this multiple consultation, and at the same time to give the patient the benefit of such complete diagnosis and treatment as can only be furnished by specialists, co-operative medical organizations have sprung up in different parts of the country. Each organization consists of a group of physicians associated under one roof, representing the various branches of medicine and surgery, who co-operate in the diagnosis and treatment of individual cases. These organizations of course vary in size, from four or five individuals to perhaps forty or fifty, according to the extent of the practice, but all are based upon the same general principles.

The patient first of all receives a general examination, and is then passed on to the various specialists for such special examinations as may throw light upon his individual case. After all the data have been gathered from the different departments, a consultation is held to decide on the diagnosis and for recommendations as to treatment. In an average medical organization, for example, there may be associated an internist, a general surgeon, a pathologist, a roentgenologist, and one or two other specialists; other groups may have still more individual units. By the co-operation of these individuals under one roof, the patient obtains the benefit of a thorough examination by specialists in several lines, and for a moderate fee.

DESIRABILITY OF ADOPTING THE CO-OPERATIVE PLAN IN DENTISTRY.

In diagnosis and treatment of mouth conditions the time has arrived for such co-operative organization of specialists, if the patient is to derive the most benefit from the great advances that have been made in the various branches of dentistry and oral surgery. Closer co-operation with the medical profession is also rendered necessary by the recent light thrown on the etiology of many diseases.

Errors in diagnosis of tooth conditions are frequently observed owing to lack of co-ordination in the clinical, roentgenologic, and other parts of the examination. The X-ray examination is frequently made and the fillings reported independently of, or entirely without, a clinical examination of the mouth, and *vice versa.* On account of this, important pathological conditions are sometimes overlooked; or, on the other hand, undue significance may be attached to the findings of either examination. Ottolengui (see *American Journal of Roentgenology,* March 1916) has recently called attention to false interpretation of dental films made by roentgenologists, and we are all familiar with cases in which clinical examination alone, without the X-ray, failed to reveal serious lesions that were present.

In the present state of dental and medical education there is a considerable gulf fixed between the physician and the dentist, each seeing things from different viewpoints. This should not be the case, but until dentistry comes to be regarded as one of the specialties of medicine, instead of as a separate profession, a connecting link between the two is necessary for handling these medicodental cases, *i.e.* a man with both a medical and a dental education, with experience in the practice of each. In the case particularly of an organization engaged in the diagnosis and elimination of chronic mouth infections as the source of systemic diseases, such an individual forms an almost indispensable unit. Speaking entirely in the abstract, and laying aside all personal elements, such a man associated with a group of dentists would be a great asset in obtaining the confidence of the medical profession and of the patients referred by them. He should be able to judge better perhaps than the average dentist as to the influence exerted by the mouth conditions upon the general health.

DIVISION OF THE WORK INTO TWO PARTS.

The work of the type of organization under consideration may be divided into the diagnostic part and the therapeutic part. From the standpoint of diagnosis, one of the members of the group should be equipped for roentgenology. The X-ray is one of the indispensable aids to proper diagnosis, and I may add treatment, of mouth conditions. It does not much matter who does the actual work, but at least one of the members must be expert in the interpretation of plates and films of the teeth. The medical member of the group should be well trained in pathology, not only for its practical bearing on diagnosis and treatment, but also in order that certain problems which come up from time to time may be worked out in the laboratory. For the clinical examination of the case there should be also an experienced dental practitioner. So much for the units on the diagnostic side.

From the standpoint of treatment, there should be an oral surgeon, whose duty it should be to remove surgically all disease conditions that will not respond to more conservative measures; second, a specialist in prophylaxis and pyorrhea treatment; third, a man devoting himself particularly to root-canal work and filling operations; and finally, a prosthodontist, whose duty it should be to replace lost organs of mastication with full regard to proper occlusion, and to the avoidance of recurrence of foci of disease similar to those originally found.

It is by such a combination in one office, the patient passing in turn through the hands of each individual for a particular part of the work, that we are able to produce the best results from our separate services, the different parts being correlated into a homogeneous whole.

DETAILS OF THE WRITER'S PLAN OF CO-OPERATION.

The routine followed in our work, and which I shall now endeavor to describe, is adapted especially to those patients referred by physicians or others for the elimination of foci of mouth infection, but is also adhered to as closely as possible with all patients.

A brief outline is first of all obtained from the patient and physician of the history, general symptoms, and physical findings. In uncomplicated cases not referred by a physician, a tentative diagnosis is made by us, blood-pressure reading, urinalysis, blood count, and other methods being employed where indicated. Then follows the examination of the mouth; this is divided into several phases, each of which supplements or leads up to another. These several phases, taken separately and not correlated into a whole, must be regarded ordinarily as of little value in themselves.

(1) CLINICAL OR VISUAL EXAMINATION.

A preliminary general survey of the mouth and associated parts should be made before attempting to employ any of the more precise methods of diagnosis such as the X-ray.

In this way the examiner obtains a clue as to the nature and extent of the roentgenologic examination required; also the presence of pyorrhea, ulcerations, suppurating sinuses, swellings, etc., is noted. Careful palpation is made for enlargements of the submaxillary lymph nodes. This is best accomplished with the index finger of one hand in the floor of the mouth pressing downward against the fingers of the other hand resting on the skin beneath the lower jaw. In this manner enlargements may be felt which would be overlooked by external palpation only. Foci of disease in the head, especially when involving the teeth, frequently present evidence in enlargement of the submaxillary and other cervical lymph nodes.

(2) ELECTRIC EXAMINATION.

This forms the connecting link between the clinical and X-ray examinations. Starting at the median line in the maxilla, each tooth in the mouth in succession is touched with the electrode from a faradic battery, and the response noted as minus, plus, or doubtful. Crowned teeth are marked C and missing teeth M. This chart then forms the basis of the X-ray examination, which should be made in all cases showing negatively responding crowned or missing teeth. The teeth with vital pulps can usually be ignored, as they practically are never the seat of hidden apical disease. The faradic test is not absolutely infallible in determining the vitality of the pulp, but it is the best means we have at present. A false negative result may be obtained sometimes in teeth with recession of the pulp and secondary dentin, while a false positive response may be due to the presence of large metallic fillings conveying the current to the gum or to contiguous vital pulps. For this reason, also, the current is not reliable in determining the vitality of pulps beneath shell crowns. A nervous patient, too, may feel a response in a pulpless tooth after receiving several shocks in succession through vital pulps.

(3) ROENTGENOLOGIC EXAMINATION.

The supreme importance of the X-ray in diagnosis of periapical dental disease is fast becoming generally accepted. The two foregoing steps in the mouth examination are to be regarded chiefly as preliminary or leading up to the roentgenologic examination. Without them as a guide we should be forced either to pick out certain suspected areas for X-ray study, thus many times probably overlooking far more important conditions, or, as is done by some operators, make films showing every tooth in the mouth, which is obviously a waste of time and material. We endeavor to preserve a mid-course by the following plan. First of all, a plate (5 x 7) is made of each side of the mouth, taking in all the teeth of the upper and lower jaws from the canines backward. This gives a general survey of the mouth, discounting any preconceived ideas as to conditions that may be present. Unsuspected abnormalities are in this way frequently discovered, which would be missed if only certain areas were covered with films; in addition to this, abnormalities about lower premolars and molars are generally shown better in plates than in films. Then each single area comprising teeth either crowned or negative to the electric current, or considered to require more detailed study than is shown in the plate, is covered with a film. The film picture shows the opposite aspect of that which is shown in the plate, this being due to the fact that the plate is an extra-oral exposure, and the film intra-oral.

By following this routine we have been rewarded many times by the detection of unerupted teeth, especially third molars, cysts, roots in the antrum, diseased antra, etc. One of the fundamental principles of a general physical examination is the importance of surveying the whole body. In the same way, in our special field we should examine the whole mouth instead of selecting suspected areas here and there with films. Our technique of making these plates and films has been described in a paper by the late Dr. E. J. Eisen and myself in the *American Journal of Roentgenology* for May 1916.

INTERPRETATION OF X-RAYS.

I shall say little here as to the interpretation of X-ray findings except to emphasize the necessity for all dentists to familiarize themselves both with the appearance of the normal hard tissues and landmarks of the jaw-bones, and with the meaning of abnormal shadows as shown in the roentgenogram. Normal anatomical variations in the position and shape of the roots of the teeth, their relation to the floor of the maxillary sinus, the mental foramen, etc., must be fully understood before the interpretation of plates and films for the detection of disease is attempted. This word of caution is perhaps not out of place, since the routine use of the X-ray by almost every dentist bids fair to become a fact in the near future. In a previous paper (Eisen and Ivy, *Dental Items of Interest,* February 1916) we have gone at some length into the pathological basis for the interpretation of dental roentgenograms.

(4) MICROSCOPIC EXAMINATION.

Where pyorrhea pockets are present, a microscopic examination of the pus is made for endamœba gingivalis, because if this organism is found, the intramuscular administration of emetin hydrochlorid is a useful adjuvant to the local surgical and mechanical treatment of the pyorrhea.

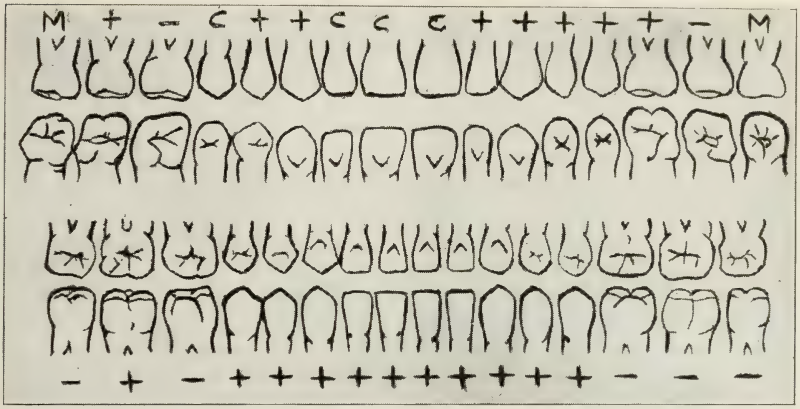
REPORT OF FINDINGS.

These various examinations being completed, we have the data upon which to make recommendations as to treatment. In Fig. 1 is shown the record of a specimen case. At the top is a chart of the teeth with the results of the faradic test; crowned and missing teeth are also marked. Below are shown the plates of the two sides, with films covering all pulpless and crowned teeth in the upper jaw. For the lower teeth the plates alone usually are sufficient. In this case our report would read about as follows:

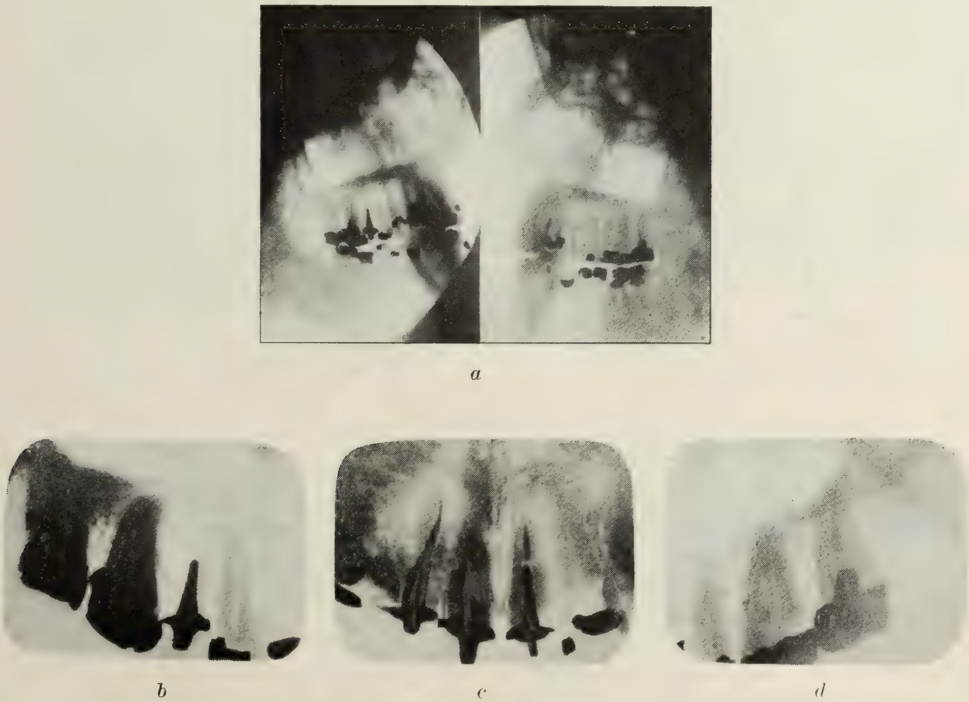
Upper right: Central incisor crowned, apex normal; lateral incisor crowned, apex diseased; second premolar crowned, apex normal; first molar pulpless, apex diseased.

Upper left: Central incisor crowned, apex normal; second molar pulpless, apex probably normal.

FIG. 1.



Faradic test record.



Faradic test record and pictures (*a*, *b*, *c*, *d*) of complete radiographic examination—forming basis for report.

Lower right: First molar pulpless, partial root-filling, apices probably normal; third molar, badly decayed roots.

Lower left: First molar pulpless, apices normal; second molar pulpless, apices diseased; third molar, badly decayed roots.

If pyorrhea is found, we report as to its extent and stage, and whether microscopic examination shows endamœba gingivalis.

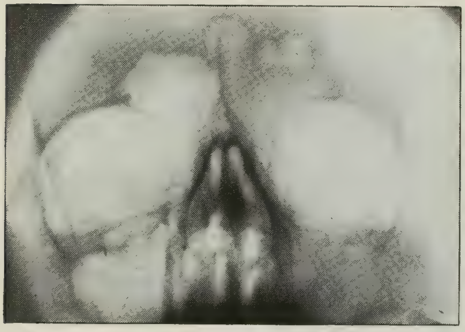
In patients sent to us by others for

examination, if so desired, we include in our report recommendations as to treatment.

EXAMINATION OF SINUSES.

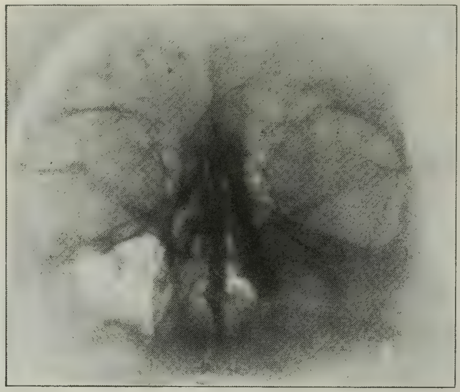
In cases of systemic disease in which our routine examination reveals no foci of infection in the mouth, and especially when symptoms suggest the possibility of sinus disease, either of dental or nasal origin, we consider a radiographic examination of the nasal accessory sinuses to be indicated. In carrying out the sinus examination as an extension of our routine, we have many times been able to diagnose baffling conditions. (See Figs. 2 and 3.)

FIG. 2.



Case of empyema of left maxillary sinus of nasal origin with symptoms referred to upper premolar teeth on same side, which were not diseased.

FIG. 3.



Case of infection of left maxillary sinus due to disease of second molar, the necrotic root of which extended directly into the sinus.

It may be remarked that nothing has been said as to examination for cavities, broken-down fillings, or other routine dental conditions. Our efforts have only been directed to the detection of foci of mouth infection which have a possible bearing on systemic diseases. In many cases our services cease at this point, but frequently we are ourselves called upon to act upon the findings brought out by the examination. Where a patient is to continue with us for treatment, we have to consider (1) which teeth must be removed; (2) which teeth are to have more conservative measures applied; (3) the type of restorations that are to be made; (4) the preparatory measures necessary for these restorations. These points are decided upon by consultation of the different members of the organization, the teeth marked for extraction being first noted on the chart. The prosthodontist, having decided upon the most suitable form of restorative appliances, marks for the operator the teeth and roots to be prepared for bridge abutments, etc.

In beginning the treatment, the teeth are carefully scaled and polished, and when pyorrhea is present this is first of all eliminated as much as possible by proper surgical measures, preceded by intramuscular administration of emetin if considered advisable.

The mouth is now in the best possible condition for the necessary surgical work. All teeth that are to be extracted are taken out at this time. This includes teeth badly affected with pyorrhea in which two-thirds or more of the peridental attachment had been destroyed, all useless roots, and all teeth showing periapical disease which cannot be cured by apical resection and curetment or more conservative measures. At this time, also, resections may be done on apically diseased teeth showing good root-fillings. The other resections must be

FIG. 4.

	Examination.	Treatment.
1. ORAL SURGEON	1. HISTORY. 2. VISUAL EXAMINATION. 3. FARADIC TEST 4. X-RAY EXAMINATION. 5. MICROSCOPIC EXAMINATION. 6. BLOOD EXAMINATIONS, ETC.	EXTRACTIONS. RESECTIONS. SYSTEMIC TREATMENT.
2. OPERATIVE DENTIST	DENTAL EXAMINATION	ROOT-CANAL WORK. CONTOUR AND OTHER RESTORATIONS.
3. PYORRHEA SPECIALIST	EXAMINATION FOR PYORRHEA	PROPHYLAXIS. PYORRHEA TREATMENT.
4. PROSTHODONTIST	REPLACEMENTS TO BE MADE	PROSTHODONTIA.

Chart illustrating the division of the work by the various units.

FIG 5.

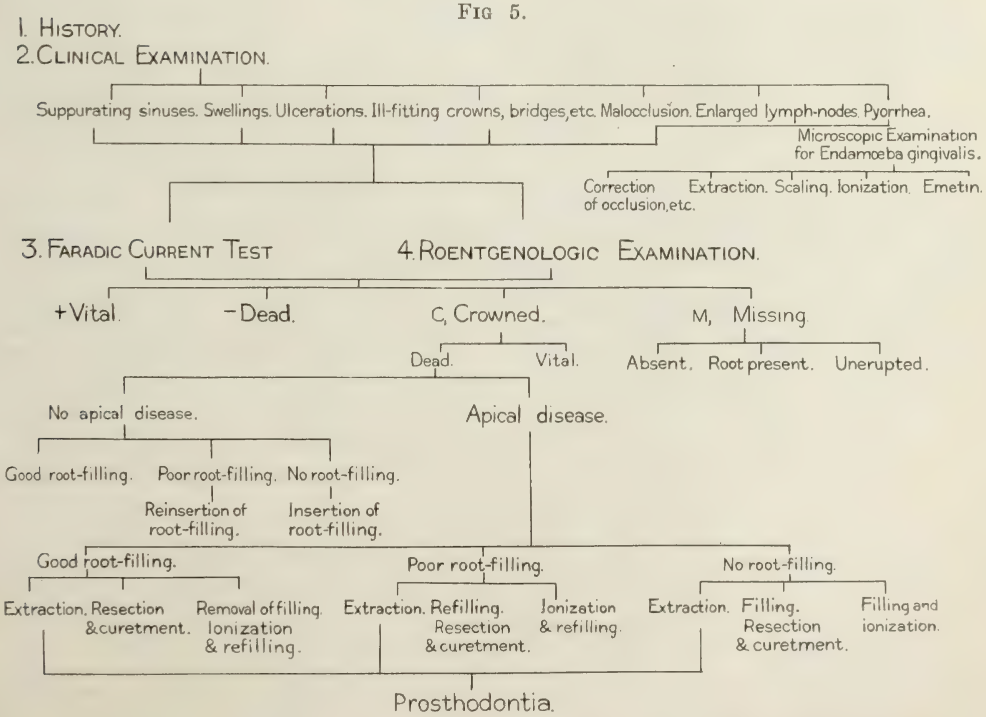

1. HISTORY.
2. CLINICAL EXAMINATION.
Suppurating sinuses. Swellings. Ulcerations. Ill-fitting crowns, bridges, etc. Malocclusion. Enlarged lymph-nodes. Pyorrhea.
Microscopic Examination for Endamoeba gingivalis.
Correction of occlusion, etc.
Extraction. Scaling. Ionization. Emetin.
3. FARADIC CURRENT TEST
4. ROENTGENOLOGIC EXAMINATION.
+Vital.
-Dead.
C, Crowned.
M, Missing.
Dead.
Vital.
Absent.
Root present.
Unerupted.
No apical disease.
Apical disease.
Good root-filling.
Poor root-filling.
No root-filling.
Reinsertion of root-filling.
Insertion of root-filling.
Good root-filling.
Poor root-filling.
No root-filling.
Extraction. Resection &curetment.
Removal of filling. Ionization & refilling.
Extraction. Refilling. Resection & curetment.
Ionization & refilling.
Extraction. Filling. Resection & curetment.
Filling and ionization.
Prosthodontia.

Chart illustrating the various examination findings, and treatment indicated.

postponed until the roots have been properly treated and filled.

Care must be exercised not to do too much of this surgical work at one sitting, thereby overwhelming the circulation with the bacteria and their toxins from the foci of infection. Chronic inflammatory tissue must also be curetted away following extraction. *If allowed to remain, this inflammatory tissue may constitute just as much of a menace as if no extraction had been done.* This fact forms a strong reason for performing these operations under local or conductive anesthesia, which allows plenty of time for doing the work thoroughly.

CULTURES.

At the time extractions or resections are performed, cultures may be made from the diseased tissue for the preparation of autogenous vaccines when indicated in the treatment of systemic conditions.

The case is now turned over to the operative dentist for root-canal treatment and filling, contour restorations, preparation of bridge abutments, etc. Each stage of the root-canal work is checked-up by the X-ray. By this means we know whether or not a canal has been filled to or through the apex. An earnest endeavor is made to observe the strictest asepsis in the root-canal work, thus avoiding an important source of periapical infection. This feature is probably of greater importance in preventing infection than the complete filling of the root-canal.

The final stage of the work consists in the replacement of the lost teeth by the prosthodontist. In addition to consideration of local mechanical factors of retention, occlusion, and mastication, these replacements are carried out with a view to avoidance of reproduction of any of the conditions that were responsible for the foci of mouth infection in the first place. There are some who contend that a pulp should never under any circumstances be devitalized in order to make an abutment for bridge work, and that if replacements cannot be made without this, the patient is better off without teeth. We do not go quite as far as this, but try to utilize vital abutments as much as possible, especially in patients who have had general systemic infection associated with periapical disease. Where devitalization cannot possibly be avoided, we believe that pulp extirpation and root-filling carried out under absolute asepsis is attended with little risk, and is justifiable.

I have not attempted to go into the details of the various steps of treatment, but have endeavored to outline the different phases of the work in order to show the advantages of co-operation.

The accompanying charts (Figs. 4 and 5) give a more or less graphic representation of the examination and treatment of a patient.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

The Prevention of Malocclusion.

By J. LOWE YOUNG, D.D.S., New York, N. Y.

(Read before the Academy of Stomatology of Philadelphia, April 25, 1916.)

THAT prevention is preferable to cure is conceded by all possessing the true professional spirit. Thus it would seem to be the duty of the dental profession to prevent, in a large measure, malocclusion in the rising generation. Let us consider how this can best be done.

If a court of reputable orthodontists were to determine when orthodontic treatment should be completed, it would unquestionably decide that time to be when all permanent teeth, except the third molars, were erupted. Think of what a boon to humanity it would be, if all orthodontic appliances could be dispensed with at twelve or thirteen years of age! To show that it is possible to do this, is the task undertaken by your essayist.

IMPORTANCE OF NORMAL OCCLUSION.

In order to impress upon you what we are striving for, it is deemed advisable to quote from a paper by your essayist, read before the First District Dental Society of the State of New York in October 1908, and published in the Dental Cosmos for April 1909:

> In the past few years considerable attention has been given to oral prophylaxis. Prophylaxis means "Preservative or preventive treatment of disease." Oral prophylaxis means "Preservative or preventive treatment in the oral cavity," which in a broad sense embraces not only healthy mucous membrane and teeth free from caries, but also the normal eruption of the teeth, resulting in normal occlusion—which means that all the teeth in one jaw are occluding with the teeth in the opposing jaw so as to furnish the largest area of grinding surface. The cusps, the inclined planes, and the sulci into which they fit should combine to furnish the owner with the best masticating apparatus, and should form dental arches which in regard to strength and durability cannot otherwise be equaled. The cusps of all the grinding teeth in such arches, interlocking with their antagonists, prevent these teeth from any variation in position either bucco-lingually or mesio-distally, provided that an harmonious pressure be exerted by the tongue, cheeks, and lips. This regularity of the teeth in normal arches is also one of the chief factors in their resistance to decay, and to disease of the surrounding tissues, for the teeth, if they are properly formed, are in a position to be as nearly self-cleansing as possible.

(See Fig. 1.)

> In order to fully appreciate normal occlusion, the arrangement of the lingual cusps should be carefully examined. This is only possible with either models or skulls, and in examining, careful attention must be paid to the mesio-lingual cusp of the upper first permanent molar. If the molars are in normal relation to each other this cusp will fit, and practically fill the mortar formed by the cusps of the lower first permanent molar, acting like a pestle, as it were.

(See Fig. 2.)

> In this mortar all excessively hard substances are placed for grinding. It should also be noted that a slight rotation of the upper first permanent molar, not readily noticeable from the buccal side, is sufficient to disarrange this wonderful grinding apparatus to a marked degree. In the normal buccal arrangement the mesio-buccal cusp of the upper first permanent molar is occluding with the mesial and distal buccal cusps of the lower first permanent molar on the same side. Further note in this examination from the

lingual side that when the lower teeth are all distal the width of one bicuspid, or mesial the width of one bicuspid, the relation of the lingual cusps of the upper teeth to those of the lower is never such as to enable the owner to properly masticate his food, although very often the interdigitation of the buccal cusps seems very good.

Fig. 1.

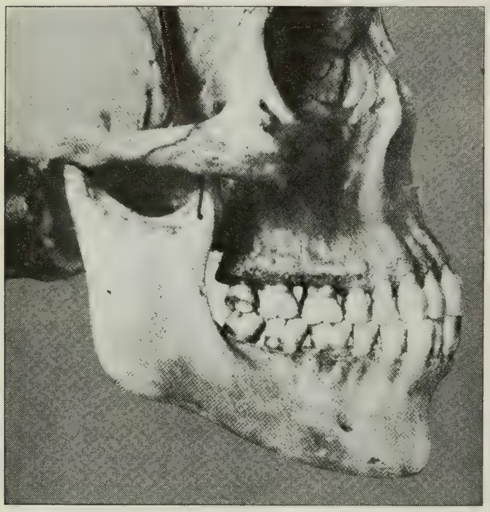


Fig. 2.

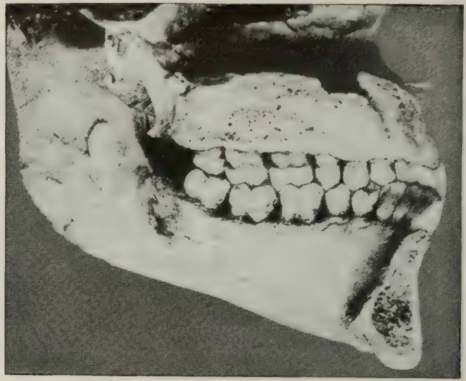
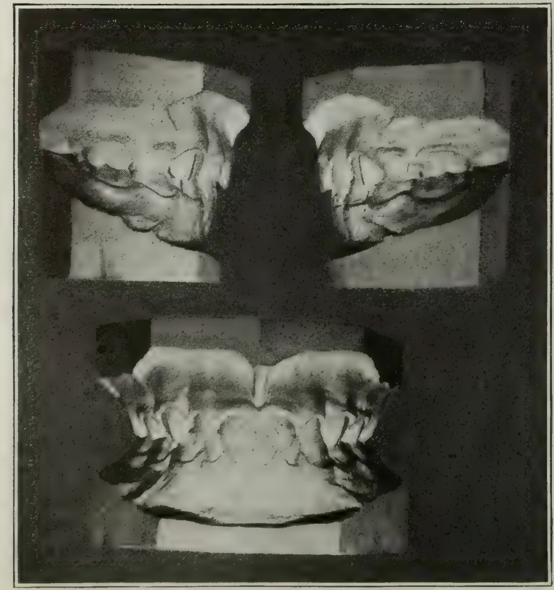


Fig. 3.



AGE AT WHICH TO BEGIN ORTHODONTIC TREATMENT.

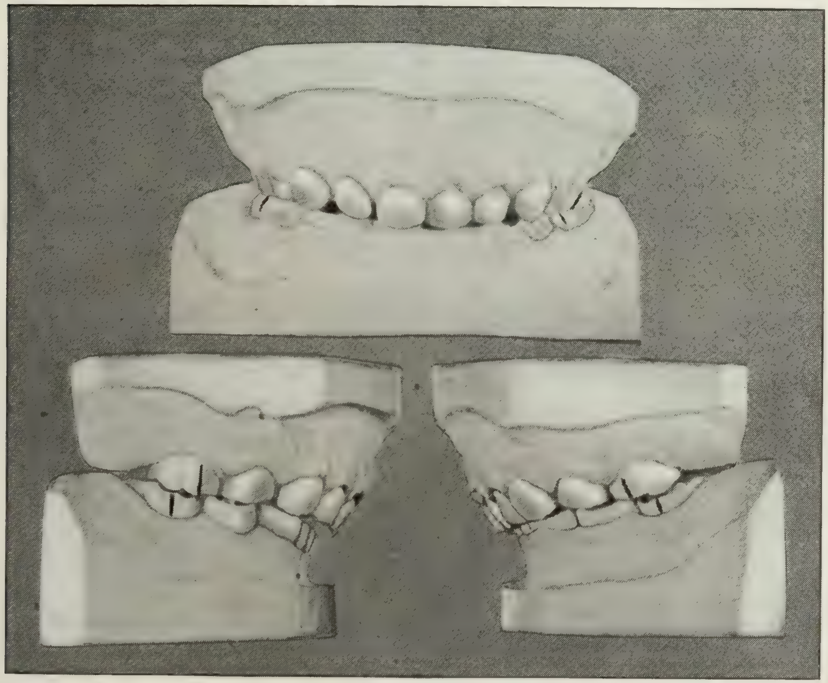
For us to be able to show results that will favorably compare with those alluded to, it becomes necessary that treatment be begun prior to or during the eruption of the permanent teeth.

The deciduous teeth are twenty in number, and should all be erupted by the third year after birth. These teeth as a rule are found to be in contact with each other, and in the great majority of cases to occlude properly. (See Fig. 3.) Granting the above, why is it that so many cases develop malocclusion? The only logical answer to this is, lack of use, owing to the foods given to children being of such character that little or no mastication is necessary in order for them to become palatable and readily swallowed.

When the deciduous teeth are found in malocclusion to a marked degree, as shown in Figs. 4, 5, and 6, it is of the utmost importance that correction should be instituted as early as conditions will permit. The longer such cases are allowed to go untreated the greater will be the difficulties to be encountered, and the less certain will be the final result. Believing that normal function is of the utmost importance in the development of the dental arches and masticating apparatus, what can be more logical than that we establish such relations as early in life as possible, so as to permit the teeth of the deciduous set to occlude properly?

If you will concede that the histologists have proved that bone is developed as the result of mechanical stimuli, then it is most logical for you to concede that when the deciduous teeth are in such relation that normal function is interfered with, normal development is impossible.

FIG. 4.



The mandible is a movable bone, and close observers are convinced that the child unconsciously shifts the mandible mesially, distally, or to either side, to get the teeth in the position to best masticate food. This position, if abnormal and allowed to continue, results in improper muscular force and necessarily improper development.

It therefore becomes the duty of every dentist conducting a family practice to send for the children of three years or older of the parents under his care, and carefully examine their mouths. All carious places should be attended to, and if the teeth do not occlude properly they should be made to do so, either by himself or by one competent to render such treatment. The dentist who would best serve his *clientèle* should take accurate impressions of all such cases, and repeat this every year, and from these make models, so that the relations which the

Fig. 5.

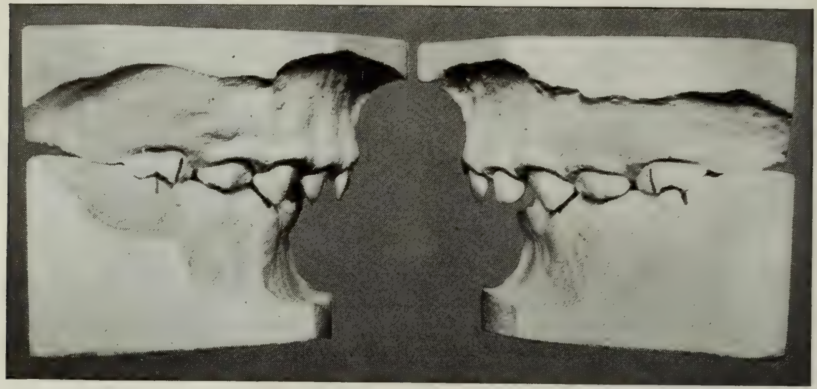
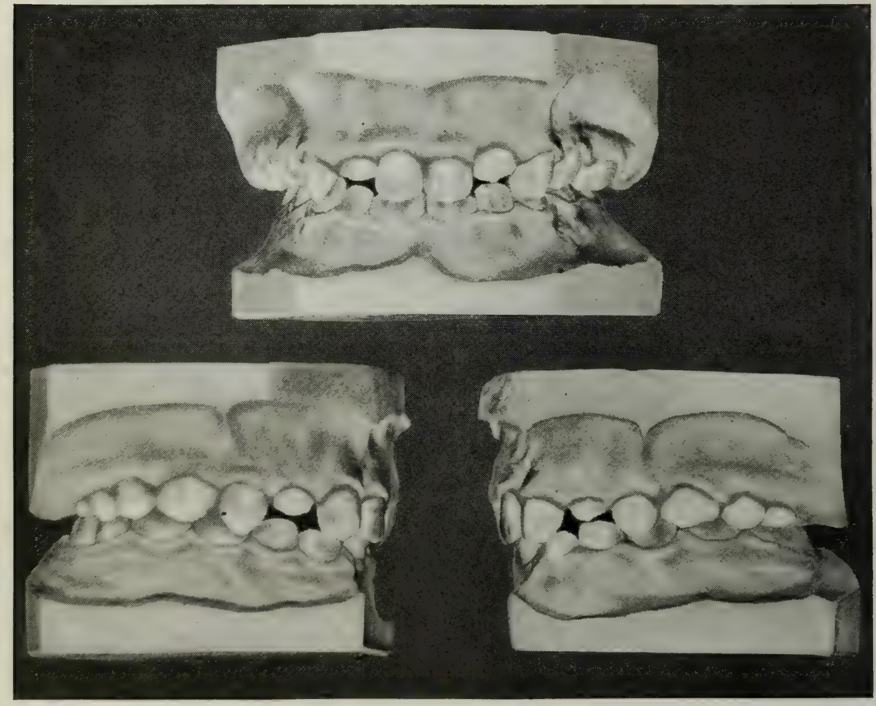


Fig. 6.



teeth in one dental arch bear to those in the opposing dental arch can be studied from the lingual as well as the buccal view. A collection of such models carefully kept by every dentist would in time prove a wonderful source from which to record indisputable facts.

Fig. 7.

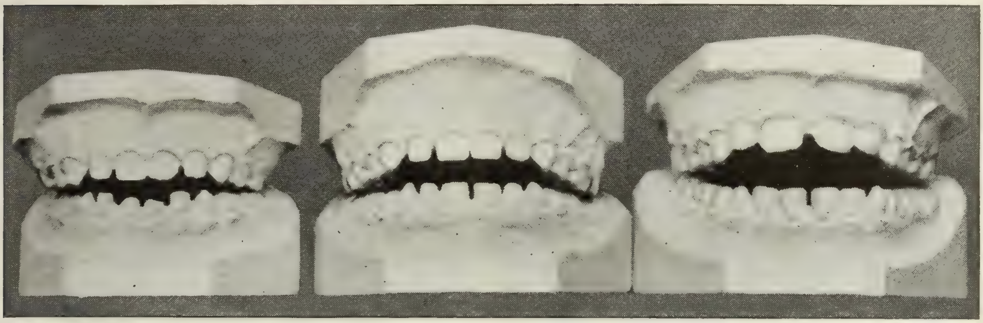
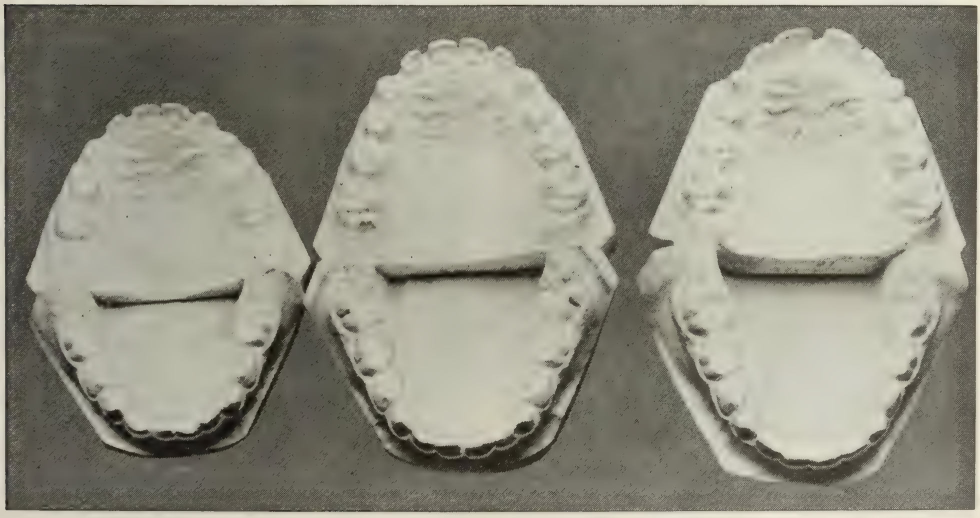


Fig. 8.



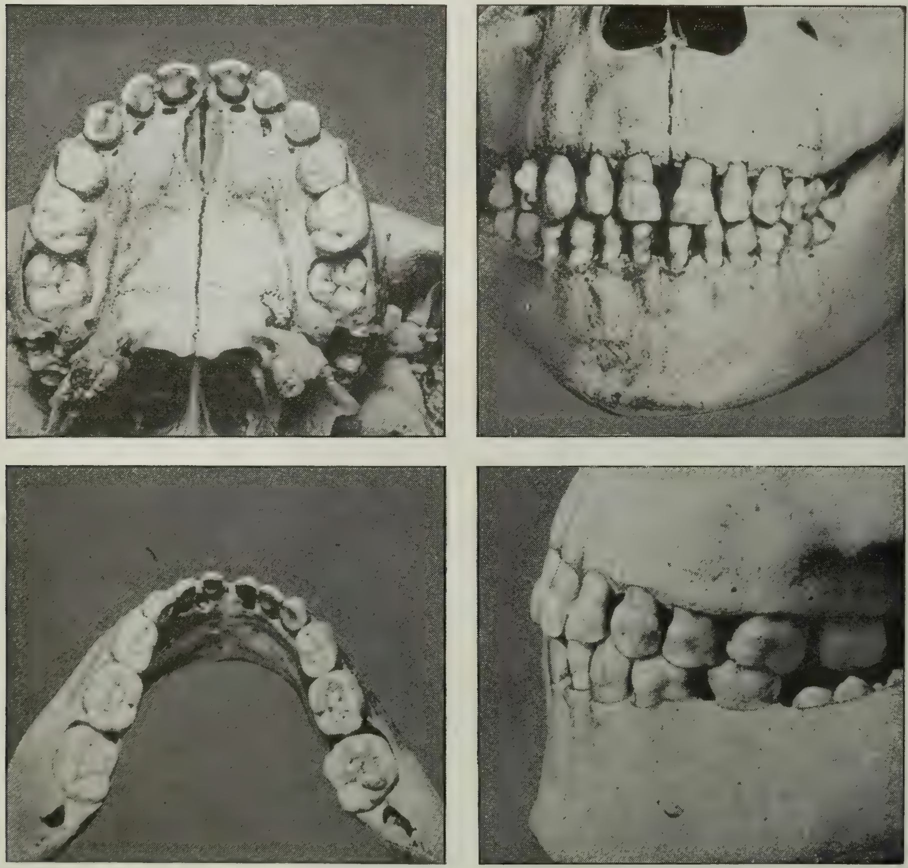
By the time the first permanent molars erupt there should be sufficient room between the deciduous canines to accommodate the four permanent incisors if normal development is taking place. (See Figs. 7, 8, and 9.) Where nature fails in this it is advisable by mechanical means to stimulate such development, and when done at the proper age all appliances can be removed as soon as all the incisor teeth have taken or been guided into their proper places, and the child permitted to enjoy a period of several months and sometimes years of freedom from appliances.

ORTHODONTIC APPLIANCES NOT OBJECTIONABLE TO CHILDREN.

It is not to be inferred from the above that children object to wearing modern orthodontic appliances when properly constructed. It is not unusual for them to exclaim when the appliance has been removed, "Oh, I don't like the way my mouth feels! Won't you put it back?" If the mother is present and you observe her closely you will note a surprised expression steal over her face.

The object, then, of removing appliances whenever we can is to permit uninterrupted development as much as possible in these young patients and also to facilitate proper cleansing of the teeth—for it must be admitted that any mechanical addition to the oral cavity renders this important process more difficult.

Fig. 9.



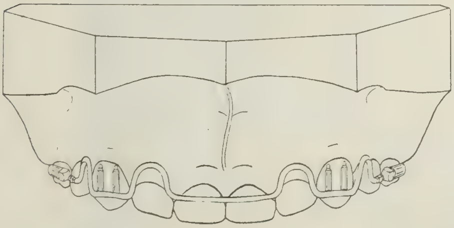
REFLEX DISTURBANCES CAUSED BY RETARDED ERUPTION OF THE TEETH.

Failure to properly provide space for the erupting incisors, in the opinion of the writer, is often responsible for various habits of childhood, owing to the reflex disturbance. When we consider the reflex disturbances caused by an impacted third molar, is it not logical to expect greater reflex disturbances where a number of teeth are impacted? It is not infrequent to have children ask to have the lingual wire pinched so as to cause it to exert pressure on the remaining deciduous teeth, and to state that the mouth feels more comfortable after the wire is pinched than formerly. This of course implies that too much force should not be exerted at any one time. Every close observer will note that children are more prone to habit spasm than adults. Orthodontic appliances may also be responsible for various habits. It therefore behooves the dentist to see to it that children under his care are subjected to as little annoyance as possible during the period in which the permanent teeth are erupting. All appliances should be as delicate and as stable as they can be made, as the more continuous the pressure is, if properly applied, the less will be the annoyance to the patient.

FIXED APPLIANCES THE BEST.

This necessitates that only fixed appliances should be used, and by fixed appliances is meant appliances so constructed that the child cannot remove them from the mouth and replace them.

FIG. 10.



Believing that it is impossible for anyone to construct an orthodontic appliance of any description that will not cause some inconvenience when placed in the child's mouth, it would seem absurd to expect a child not to relieve the inconvenience when it lies within his power to do so.

Fixed appliances can be constructed so delicate and yet so stable that the annoyance caused by them is so slight that it entirely subsides in a very short time. (Figs. 10, 11, and 12.)

From the completion of the eruption of the incisors, which is usually in the ninth year, until the eruption of the remaining permanent teeth there is a lapse of a year or more, and it is during this period that the child should be free from all mechanical disturbance. He should be kept under observation, however, owing to the variation in time of eruption of these teeth, and also to the possibility of their requiring attention. Any of the twelve permanent teeth that replace the deciduous canines and molars may require guiding into their proper positions. This may necessitate the readjustment of appliances, and it should be done without delay, so that the erupting tooth may be guided to position and frequently rotated as well. In all such work it should be borne in mind that nothing should be done that would tend to prevent eruption.

FIG. 11.

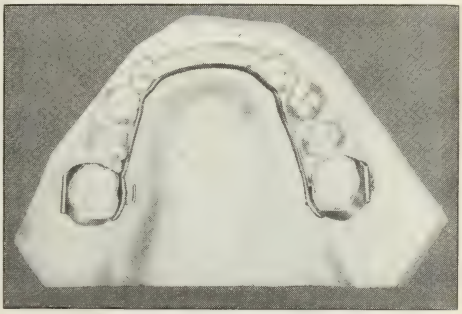
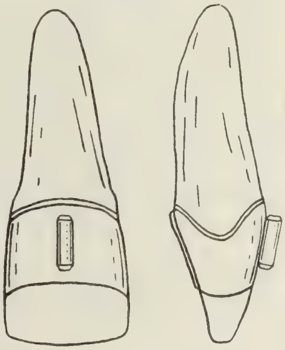


FIG. 12.

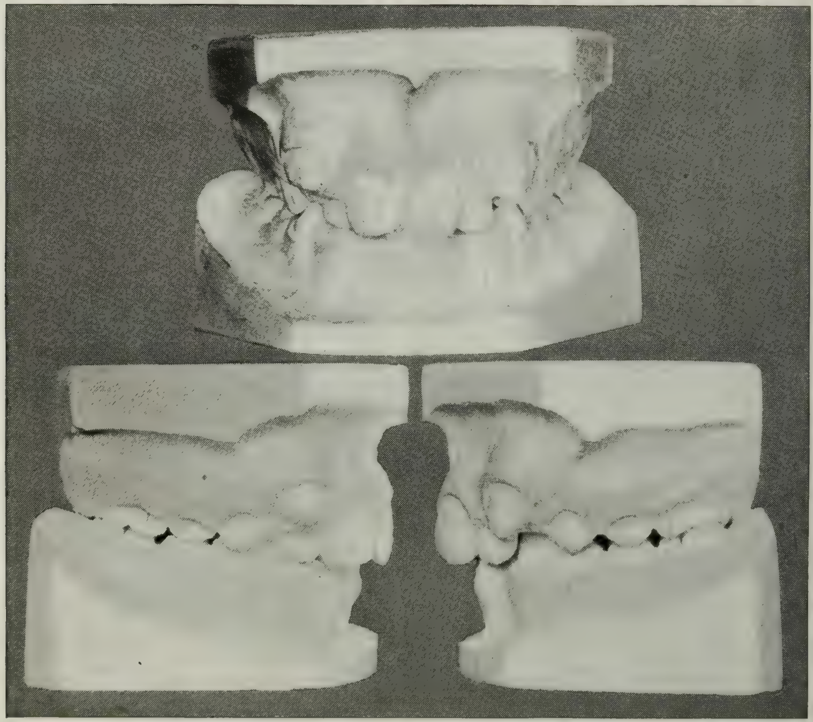


Bands can be adjusted and cemented on bicuspid teeth as soon as both cusps are through the gum without causing any annoyance to the patient, if the proper technique is followed. It has been found that such teeth can be rotated in a few weeks, and if held in their proper positions until fully erupted they will remain so.

TECHNIQUE OF BANDING PARTIALLY ERUPTED BICUSPIDS.

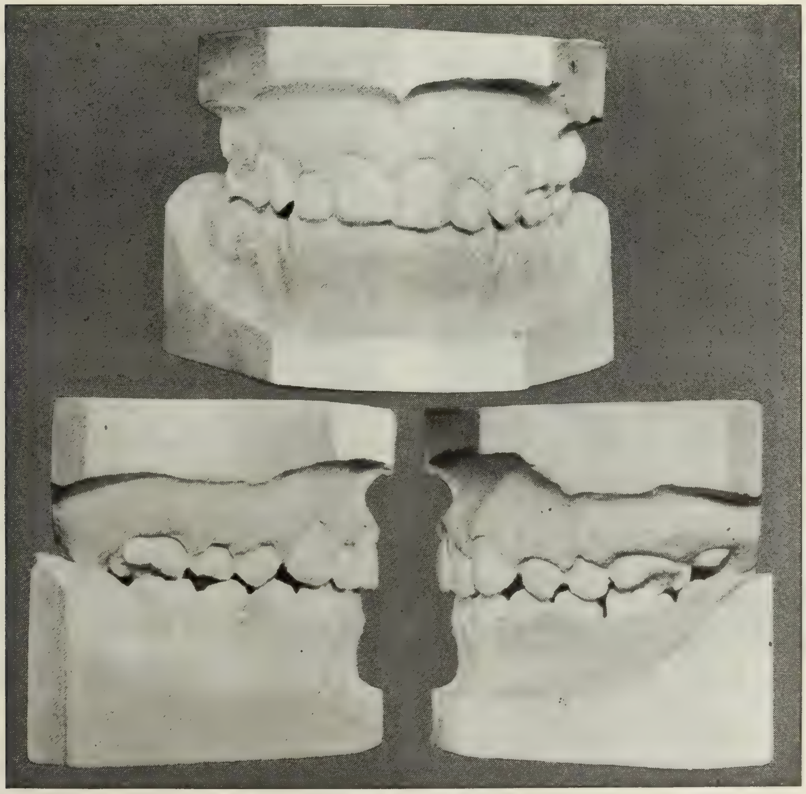
For a number of years the writer has kept in stock a number of plain bands made from material .003 of an inch in thickness and .15 of an inch in width, and cut in lengths varying .02 of an inch, ranging from .80 to 1.10 of an inch. The ends of these are brought together with a slight lap and soldered. Selecting the band judged to be the nearest to the size of the tooth to be banded, it is tried on the tooth, and if too small a larger one is chosen, and in this way we are soon able to select from the stock a band that will accurately fit the tooth. Such a band can be passed its full width under the free margin of the gum without causing any annoyance to the patient. Whenever a patient complains of a band being too tight around a tooth one may rest assured that the band is too large in circumference, and that it is pressing into the soft tissue, as it is impossible to compress a tooth with a band sufficiently to cause pain. A suitable spur made from round wire not over .020 of an inch in diameter is soldered well down to the gingival border of the band, and should be left long enough so that the free end can be turned up to form a projection above the free margin of the gum, in order to place a ligature on it after the cement is set. In this way the pull of the ligature used to rotate the tooth tends to elongate the tooth in its socket at the same time. This is most important, as no force should be applied to an erupting tooth that will prevent its eruption.

Fig. 13.



From time to time as the tooth erupts the free end of the spur can be cut off, thus preventing its being bent out of position and acting as an irritant. At first thought it may seem that such a procedure as the above would be inadvisable, but when we consider that the bone surrounding the deciduous teeth is resorbed at the same time that the roots of these teeth are, and that new bone grows up with the erupting permanent tooth, and further, that there is never any fibrous attachment of any description to the enamel surfaces of the tooth, it becomes very clear why it is so easy to fit bands as described on partially erupted teeth.

Fig. 14.



Figs. 13, 14, 15, and 16 show results of treatment of a very pronounced case of malocclusion without extraction.

CONGENITAL ABSENCE OF TEETH.

Experience has shown that it is not unusual to find one or more bicuspids congenitally absent, the first bicuspid occasionally and the second bicuspid much more frequently. In the writer's collection of models the following teeth are missing:

One upper lateral: Two cases. Two upper laterals: Four cases. One upper first bicuspid: One—in a case with three second bicuspids missing. Two upper first bicuspids: One—in a case with seven bicuspids missing. One upper second bicuspid: One case. Two upper second bicuspids: Two cases. Upper second bicuspid in conjunction with upper first bicuspid: Two cases. Two upper second molars: One case. One lower central: Two cases. Two lower centrals: One case. One lower lateral and two lower centrals: One case. One lower lateral: One case. Two lower laterals: None. One lower first bicuspid: One—in a case with six other bicuspids missing. Two lower first bicuspids: None. One lower second bicuspid: One case. Two lower second bicuspids: Seven cases. Two lower second molars: One case.

The above shows the necessity of having X-ray pictures made before referring patients with deciduous molars firmly fixed to the exodontist, in order to be sure that there is a permanent tooth to replace the deciduous one.

ONE CAUSE FOR RETARDED ERUPTION OF BICUSPIDS.

It has been noted that many of the second deciduous molars become wedged between the first bicuspid and first molar, preventing the eruption of the underlying permanent tooth. In one case this condition has been observed by the writer as late in life as the twenty-sixth year. It has been further noted that the retention of these deciduous molars is a menace to the mesial surface of the first permanent molar, because of the broad approximal contact formed between the teeth, rendering proper cleansing of this surface very difficult, and often resulting in decay at this point. As the bicuspids have always been found to erupt unaided within a few months after the removal of the deciduous molars if these are removed not later than the twelfth year, it would seem that there could be no objection to their removal when the X-ray shows the presence of a permanent tooth to replace the deciduous one.

Fig. 15.

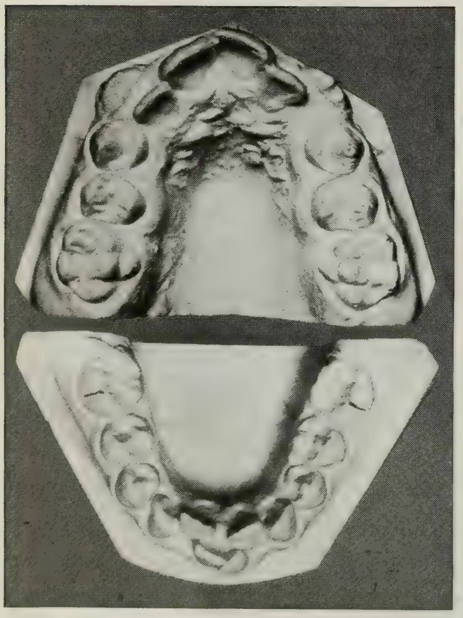
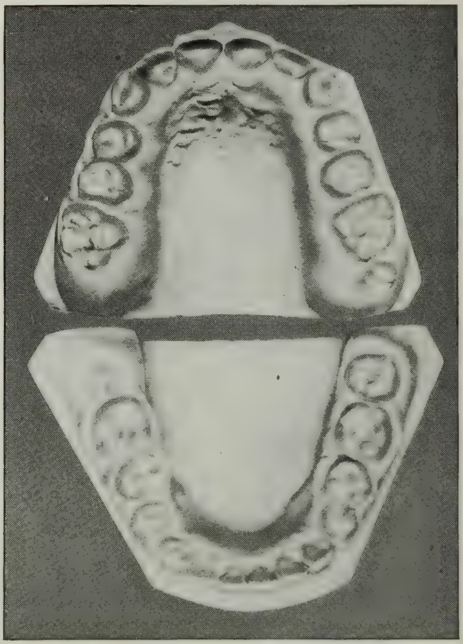


Fig. 16.



According to Black's "Dental Anatomy," the mesio-distal diameter of the crown of the upper second deciduous molar averages .32 of an inch, while the second bicuspid which replaces it averages but .26 of an inch in like diameter. The mesio-distal diameter of the crown of the lower second deciduous molars averages .38 of an inch, while the second bicuspids that replace them average but .28 of an inch in like diameter.

From this one would naturally infer that, where these deciduous molars were not prematurely lost either in whole or in part, the bicuspid should erupt in proper position. Observation has proved that a large percentage of the second bicuspids, both upper and lower—but more of the lower than of the upper—present themselves through the gums rotated to a marked degree. The reason for this is difficult to state, but it would seem that it is due very largely to lack of normal resorption of the roots of the deciduous teeth which they replace.

The erupting tooth follows the course of least resistance, and may be deflected either buccally or lingually, or it may be rotated. This, however, cannot be entirely responsible for rotated second bicuspids, as several have been observed rotated a complete half-turn, and even with the buccal and lingual cusps transposed as to position. Such teeth, if banded as soon as both cusps are through the gum, can be rotated without difficulty.

It is not to be assumed from the preceding that it is impossible to render orthodontic service or rotate teeth after full eruption has taken place, for many cases could be shown to disprove this. But when we bear in mind the fact that in order to move a tooth we must, by pressure of some sort, induce resorption of bone, and that we must wait not only for new bone to form but often for years afterward in order to make sure that the teeth will remain in their new positions, does it not seem absurd to expect as good results from orthodontic treatment as can be attained when the teeth are treated during the normal time of eruption? The force required to properly place erupting teeth, if measurable, might be expressed in ounces, while that required to move fully erupted teeth might be expressed in tons.

It has been the writer's experience that the finished cases that more closely conform to normal occlusion are those in which treatment is started prior to or shortly after the beginning of the eruption of the permanent teeth.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

A Further Discussion of the Salivary Factor as an Aid in the Diagnosis of Dental Caries or Immunity Therefrom.

By JOHN ALBERT MARSHALL, M.S., D.D.S., San Francisco, Cal.

From the Rudolph Spreckels Physiological Laboratories and the Laboratories of the Department of Dentistry, University of California.

RECENT criticisms have appeared by Gies of the salivary factor and of my proofs of its relationship to the incidence of dental caries. (See *Journal of the Allied Dental Societies*, June 1916, p. 275; also September 1916, p. 488.) To the first of these articles I have replied in the November number of the DENTAL COSMOS, and it is with the second article that this paper will deal more particularly.

The points under discussion on which I have laid emphasis are briefly these:

(1) The acidity of the saliva is a variable, and as such cannot be utilized as a basis for diagnosis.

(2) The alkalinity of the saliva is likewise a variable, and hence without diagnostic value.

(3) The saliva possesses a certain compensating mechanism analogous to that exhibited by blood, which holds relatively constant the total neutralizing power of the saliva.

(4) That in dental caries we find a certain relationship, or salivary factor,

which is of different magnitude from that exhibited by saliva obtained from an immunity to dental caries.

Gies' discussion hinges on a comparison of different alkalinities and acidities, but ignores the point of importance of the paper, namely, the neutralizing power of the saliva. On page 493 he states:

> No resting saliva has ever been reported by Marshall that did not possess a reserve of power to neutralize acid. Even the strongly acid saliva of his epileptic patients (secreted "during convulsions") had a reserve of this power. What, then, can be the practical dental importance of a *greater* reserve of neutralizing power in *activated* saliva than in resting saliva, the reserve in *resting* saliva *never being consumed!* Would not such a greater reserve be, on the basis of Marshall's original argument in favor of it, mere redundancy?

I have regarded the power of saliva to maintain its reaction between the H + ion concentrations at which phenolphthalein and *p*-nitrophenol change color as indicative of the power of the saliva to maintain its neutrality. The reactions at which these color changes occur, however, are only arbitrarily chosen points at either extremity of a relatively wide range of H + ion concentrations. Power to maintain the reaction within *this* range is probably indicative of power to maintain the reaction within a *narrower* range. Because I have chosen the above indicators for convenience of measurement, it does not follow that the reactions at which they change color are at the *boundary lines* which separate a deleterious reaction from an innocuous one; these boundary lines may quite possibly lie considerably *within* the chosen limits. Reserve neutralizing power with respect to the arbitrarily chosen indicators, therefore, is not necessarily a reserve neutralizing power with respect to physiological or pathological processes. But the fact that activated saliva has a greater neutralizing power, between the arbitrary limits chosen, than normal resting saliva, may properly be held to indicate that between the physiological limits (which are as yet to be determined) the neutralizing power of activated saliva would also be greater than that of resting saliva.

Without going into needless detail, it is evident that Gies infers that I regard the salivary factor as an etiological factor in dental caries. Whether the magnitude of the salivary factor is a cause of or an effect produced by caries, or an effect of some cause which also produces caries, I have not stated. In my second article, however, there was an hypothesis tentatively advanced suggested by an analogy drawn from bacteriology, and to which further reference will be made later.

Misquotation is sometimes an oversight, but the following misquotation by Gies on page 496 can hardly be regarded in that light:

> But in Marshall's view, I recall, this makes no difference, for, as he stated in his first paper, resting saliva (and everything in it, of course) has nothing to do with the causation or progress of dental caries. It is the deficiency in degree of alkalinity of *activated* saliva, not the acidic quality of *resting* saliva, that, according to Marshall, determines the susceptibility or immunity.

It is difficult for me to understand what justification Gies has to so misquote me. I have never said that the deficiency in degree of alkalinity of activated saliva, and not the acidic quality of the resting saliva, determines susceptibility or immunity. Gies is quite in error when he attributes any such statement as that to me. On pages 267 and 277 of the first article appearing in the February number of the *American Journal of Physiology* my views on this point are very clearly enunciated.

He claims further on page 496 that he has proved the salivary "constant" a variable, but the data submitted do not bear out his statement, for when his table on page 295 of the June number is studied it is found that he has combined the analyses of saliva obtained in response to many differing types of stimuli. This, as has been previously pointed out, is inadmissible. A little more light is thrown on this point when the analyses of the paraffin saliva are examined. For the 27 tests of patient 1 (immunity) the average is 61.05, and for patient 4 (caries), who is given in the table as varying from 44.2–97.6, *only one analysis under paraffin stimulus was made,* namely, series No. 38 (unfiltered) in which a factor of 88.2 was evaluated. The averages of patients 2 and 3 are on the borderline, and do not present conclusive evidence. It is obvious, then, that *Gies' claim* of proving the salivary factor a variable one is, to *quote him, "without basis in fact."*

Gies suggests on page 499 that the saliva collected during an epileptic convulsion should be made the basis of comparison with saliva collected during a time when the patient is quiet. This suggestion is both novel and interesting —novel in that he ignores the profound psychic disturbances incident to the convulsion, and interesting in his evident disregard of the condition, both nervous and muscular, of the patient at the time of an epileptic seizure. As has been previously pointed out, the two samples of normal resting saliva and paraffin saliva should be obtained in the shortest space of time compatible with normal physiological functioning, hence the obvious error in suggesting that a normal resting saliva collected at one time of day, or perhaps even a few days earlier, should be compared with a saliva collected during a seizure. Nevertheless, Gies has laboriously compiled in his table 2 a set of figures based upon this false conception of salivary activity. It would be interesting if Gies would explain just how one might obtain a normal resting saliva from a patient about to have an epileptic seizure.

On page 502, Gies suggests that we disregard the acidity titration entirely, and work out a factor on the alkalinity basis. On pages 2 and 3 of my second article the following sentences occur:

> A peculiar fact which has been brought out in this series of tests is, that in over 42 per cent. of the cases the activated saliva was alkaline instead of acid to phenol-phthalein. In the reporting of these analyses, the alkalinity, as indicated by a minus sign, has been deducted, for the determination of the neutralizing power, from the alkalinity as found with para-nitro-phenol.

So in this case Gies disregards the neutralizing power of the activated saliva entirely, and determines the salivary factor by dividing the *neutralizing power* of the *normal resting sample* by the *alkalinity of the activated sample.* This method of mathematical procedure, in which Gies ignores the neutralizing power *ad libitum* when he wishes to make a point, is wholly unjustified. But it proves to Gies that the "unusually exact check is without basis in fact."

Discussions which include wilful disregard of the principles involved, as is evidenced by the foregoing, are without scientific merit, since they owe their existence to misrepresentation of facts. The statement at top of page 503 is thus shown to be absolutely untrue. In the instance of patient 79 mentioned in my first paper the difference of 0.40 cc. was overlooked in the clerical labor of preparing the tables, and remained unnoticed until the article was in press.

The illustrations cited on page 507 clearly indicate the misconception of the factor under which Gies is laboring. As has been explained elsewhere, if we consider a series of alkalinity titrations separately or a series of acidity titrations separately, we fail to arrive at co-ordinate results. Gies himself determined this in 1910 (*Journal of the Allied Societies,* vol. v, page 276) and reported that "No significant relationship between the acidity of the average specimen of saliva to phenol-phthalein and the condition of the teeth is shown by the results." But the neutralizing power *does* provide a relationship, and is expressed by the salivary factor.

In regard to pages 507-509, I find myself unable to assent to the validity of the analogies drawn by Gies, which appear to me to be devoid of application to the question at issue. I gather, however, from their nature, that the essential point of disagreement between us lies in my method of measuring the neutralizing power by combining the measurements of titratable alkalinity and acidity. These quantities Gies would appear to regard as incommensurable. It is, however, a familiar fact that true alkalinity and acidity are inversely proportional, so that they cannot be regarded as totally independent variables. The essential consequence of my technique is to reduce all salivas to a common standard reaction—neutrality to phenol-phthalein—and, starting from that point, to determine the quantity of acid required to render the samples neutral to *p*-nitrophenol. The measurement of the neutralizing power of saliva is therefore nothing more nor less than a measurement of its buffer value. This buffer value is strictly analogous to the measurement of the buffer value of the blood, a quantity the physiological significance of which is *definite* and yet admittedly *different* from the significance of the actual reaction (OH' ion concentration) of the blood. So in the case of saliva we infer that the buffer value has a closer relation to the incidence of caries than the actual acidity or alkalinity of any given sample, at any given moment. Whether the significance of the buffer value or neutralizing power is direct (that is, due primarily to its power of maintaining neutrality) or is indirect (that is, symptomatic of other as yet unascertained physiological conditions or pathological disturbances), we do not feel as yet able to definitely decide, although in my second article I tentatively advanced an hypothesis in harmony with the former rather than the latter of the above views, an hypothesis for which definite proof is as yet unpublished.

The remarks in reference to indicators, stimuli, etc., have been answered in my article published in the DENTAL COSMOS for November 1916, page 1225, and further elaboration would be unnecessary repetition.

Gies' notes based on my paper, "An Acidimetric Study of the Saliva and Its Relation to Diet and Caries," do not involve any new points in the discussion, but merely present further proof of his misconception of my terms "total neutralizing power" and "salivary factor."

The criticisms brought forward by Gies have totally failed to disprove my three main points, to wit, the variability of the alkalinity titrations, the variability of the acidity titrations, and lastly the relative *constancy* of the nicely balanced neutralizing power. Upon these points I have based certain conclusions (*American Journal of Physiology,* vol. xxxvi, pp. 277 and 278, and vol. xl, p. 10), and these conclusions, I reaffirm, are valid.

Gas (N_2O) and Oxygen Analgesia for Conservative Operations.

By THOMAS B. HARTZELL, M.D., D.M.D., Minneapolis, Minn.,
PROFESSOR OF ORAL SURGERY AND CLINICAL PATHOLOGY, DENTAL DEPARTMENT, UNIVERSITY OF MINNESOTA, MINNEAPOLIS.

(Report presented to Section VIII, Sixth International Dental Congress, London, 1914.)

IT were bootless to spend the valuable time of this body to recount the story of anesthesia, interesting as that story might be. Therefore the writer of this report will evidence his appreciation of the great honor conferred upon him by this organization by being brief and direct.

When, in 1844, Horace Wells first intentionally used nitrous oxid to produce anesthesia, he opened a door to the prisoners of pain, and by that opened door countless thousands have escaped the thraldom of suffering. It is meet, therefore, that a grateful people should have erected a memorial in his honor in the city of Boston, which city was the scene of his labors. Today I reverently do him honor and regret his untimely death, for his life was untainted by commercialism, and he sadly surrendered that life because he could not convince the world of his great discovery.

After his death, nitrous oxid anesthesia was little used until 1868, when, through the efforts of Dr. Evans, the Dental Hospital of London* issued a report that was so favorable that this means of anesthetization was at once adopted by the dental world, and has since maintained the first place among our anesthetics. At the present time nitrous oxid and oxygen is used in all American hospitals, both to induce anesthesia of itself, and as a preliminary to ether anesthesia.

NITROUS OXID AND OXYGEN ANALGESIA IN GENERAL SURGERY.

In some of our great surgical clinics, nitrous oxid and oxygen has almost supplanted other anesthetics. A notable example of its use is that of the great surgical clinic of George W. Crile of Lakeside Hospital in the city of Cleveland, Ohio.

As our respect for life and safety has increased, we have studied more and more to develop the technique of nitrous oxid and oxygen control and administration, so that in America, at least, dental literature is replete with descriptions of apparatus and the most advanced methods of obtaining the desired results in anesthesia and analgesia. And though the value of nitrous oxid was early recognized, it is but recently that many have become sufficiently expert in its use to obtain satisfactory results in prolonged administrations.

In the past the difficulties were due to the fact that the matter of proportioning the gases had not been reduced to an exact science, the proportioning devices being so crude that it required the entire attention of the anesthetist to observe the symptoms of the patient and manipulate the apparatus, making it a practical impossibility for the operator to give his own anesthetic for other than short operations; and even then it was next to impossible to maintain an even anesthesia for any considerable period of time.

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* Hewitt's "Anesthesia."

IMPROVEMENTS IN APPARATUS FOR ADMINISTERING THE GASES.

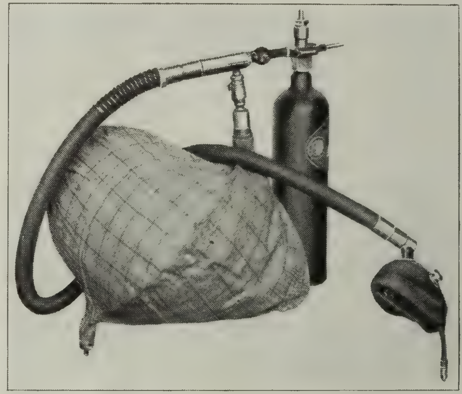
The adoption of nitrous oxid and oxygen by the profession generally has been retarded by the fact that our apparatus has not sufficiently controlled the gases to enable the average practitioner always to obtain the best results. As improvements in apparatus have been made from time to time, the use of these gases has become more general, and the present-day appliances for controlling them are so perfect that anyone with a reasonable amount of application can use them successfully. In other words, the machine now does the maximum portion of the work; it only remains for the anesthetist to familiarize himself with the symptoms of analgesia and the handling of patients in the anesthetic state. Rapid strides have been made recently in the way of improved apparatus for controlling the gases, and the general adoption of this anesthetic has been in proportion to the improvements made in the apparatus for its administration. The near approach to perfection that has been attained in these modern appliances has resulted in the more general use of these agents by surgeons for all types of surgical procedure.

The increasing use of nitrous oxid in America received a forward impulse in January 1911, when Dr. J. A. Heidbrink of Minneapolis suggested the use of a gas-pressure regulator for reducing and controlling the high tension under which the gases flow from the metal containers into which they are compressed. Nitrous oxid, under high pressure, is a liquid, and expands unevenly or spasmodically, so that it is almost impossible to obtain an even flow directly from the tank for any great length of time. The advantage of the pressure regulator proved so great that nearly all manufacturers made it a part of their apparatus. This was a long step in the right direction, because successful results in anesthesia and analgesia depend upon the ability to deliver to the patient an even flow of known quantity of the combined gases, mixed in definitely known percentages. Perfection has been more or less nearly approached by the different types of apparatus, of which there are several now in use. Let us for a few moments review some of the older anesthetizing devices.

APPARATUS FOR MAINTAINING CONTINUOUS ANESTHESIA.

First, there was the type that has little or no control, requiring the operator to depend entirely upon his own skill to proportion the gases, and depending on admixture of atmospheric air for oxygen supply, a manifestly uncertain method which has served its turn and has been cast aside. In this oldest type of device, nitrous oxid was discharged from the metal container into a large silk bag and was conveyed to the patient through a rubber tube and inhaling-mask made to cover both nose and mouth, the mask being furnished with an inhaling valve so that the patient could not rebreathe the exhaled gases. By this method with this type of apparatus and control, deep anesthesia occurred in thirty to sixty seconds, but was exceedingly difficult to maintain for dental operations, because of the lack of the ability to control and maintain dosage, and also because the mask had to be removed to permit operating in the mouth. (See Fig. 1.)

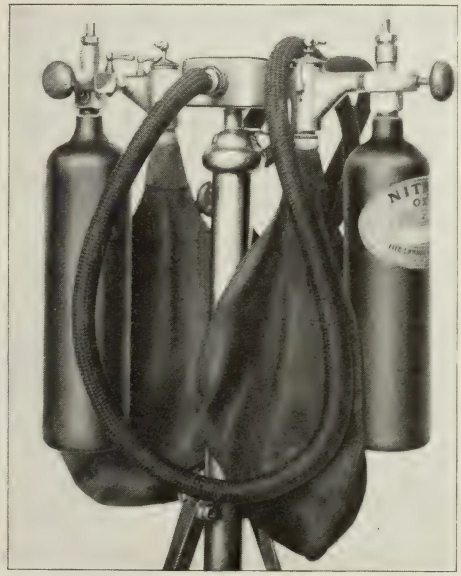
FIG. 1.



Second came the type which has the gas under partial restraint, suggested by

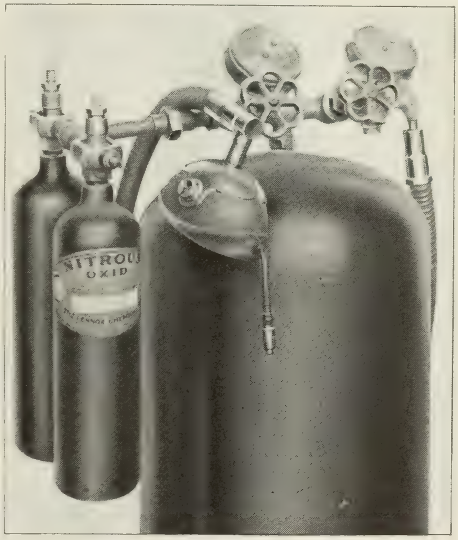
Teter of Cleveland. The gases were discharged from their metal containers into two rubber bags, and proportioned to the patient by the pressure of the gas flowing from the metal container or by pressure of the hand upon the bag containing the gas desired. An important adjunct of this type was the nasal inhaler. This, while it excluded the atmospheric air, allowed of the substitution of oxygen from the container. With this type of apparatus it was possible for a skilful anesthetist to maintain a continuous anesthesia. (See Fig. 2.) This method became quite popular in the United States.

Fig. 2.



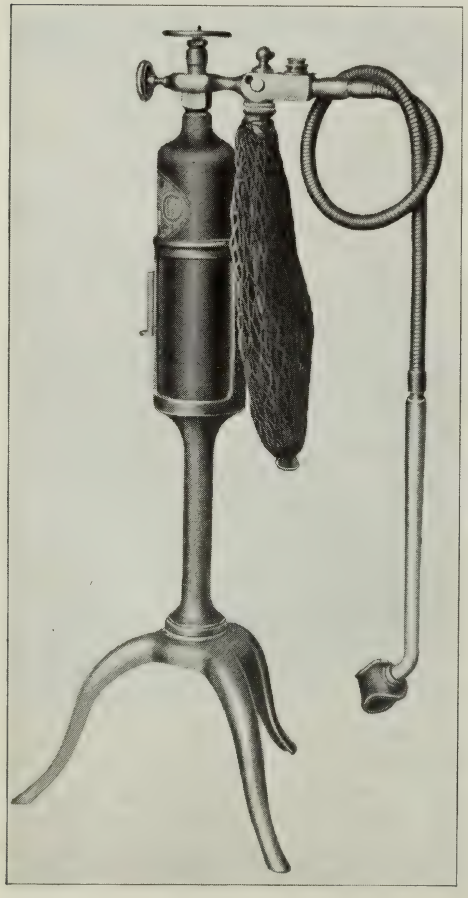
About the same period we were given the air and nitrous oxid inhaler for continuous administration, the gas being discharged into a large metal container, and kept as nearly as possible under a pressure of one hundred pounds to the square inch. To insure a steady flowage of gas to the patient, it was provided with a steam gage to register the pressure of gas in the container. It was also furnished with a flowage gage to indicate, by a registering needle, the steadiness of flow of gas to the patient. Atmospheric air was admitted through an intake valve in the inhaler. By careful watching and adjustment of this valve so that just the right amount of air was admitted, analgesia could be obtained or a continuous anesthesia maintained. The writer added to this device an oxygen container and a mixing chamber for the gases. (See Fig. 3.) This device was in more or less successful use in the private practice of the writer and public clinic of the college of dentistry of the University of Minnesota, but is now superseded by the vastly more accurate and perfect method of Heidbrink, which has made possible the standardization of both administration and dosage of oxygen and nitrous oxid for either analgesia or anesthesia. In this connection should be mentioned the method of self-administration suggested by Guedel, and used by him in obstetrical procedures. While the method may be safe for brief periods, the author cannot recommend it for continued analgesia, nitrous oxid being safe only when combined with a sufficient amount of oxygen to bathe the respiratory center normally. (See Fig. 4.)

Fig. 3.



Third came the perfected type, which, as stated, delivers to the patient an even flow of known quantity of the mixed gases in definitely known percentages. The writer believes he is warranted in saying that the recent marked advancement in analgesia in America was inspired and made possible by the efforts of Dr. Heidbrink. By analgesia the writer means a condition or state of being in which pain-producing stimuli are inhibited without loss of consciousness—a state in which the patient knows what is going on about him, and can even aid the operator by changing his position, turning toward the light, bending forward, expectorating, etc. While other improved appliances have much that is meritorious, this is the one that meets all the requirements, in that it delivers to the patient an even flow of known quantity of the combined gases, mixed in definitely known percentages. This apparatus goes a step farther, and shows at all times, by flowage indicators, the slightest variation in the gas percentages by markings on dials. Its gas-pressure regulators can be set to produce analgesia or anesthesia as desired, and it is only in exceptional cases that the machine, once adjusted for a given purpose, requires further attention from the operator. There is but one small bag from which the gases are breathed. Indeed, if it were not for the advantage of rebreathing, one would not need a bag at all, the regulation of the flow is so accurate. The small size and compactness of the inhaling apparatus makes it easily capable of sterilization by boiling. (See Fig. 5.)

FIG. 4.



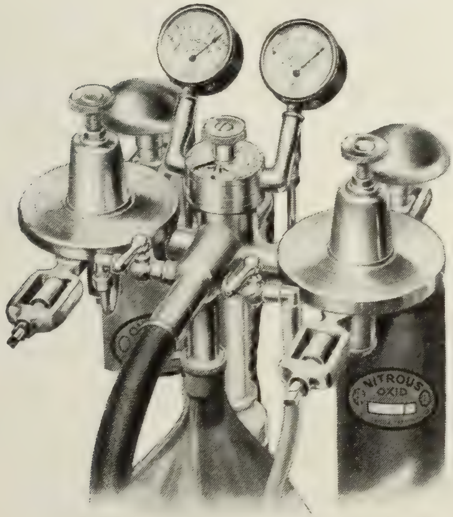
ADVANTAGES OF THE REBREATHING METHOD.

The creator of this type of anesthetic device takes advantage of our present knowledge regarding the stimulating properties of carbon dioxid in the physiology of respiration, and provides for the conservation of that gas to the end that it may be rebreathed, thus saving both nitrous oxid and oxygen, and at the same time strengthening and maintaining the respiratory movement.

Haldane, whose work on the physiology of respiration has attracted world-wide attention, tells us that even a slight increase in the percentage of carbon dioxid in the air causes an increase first in the depth and later in the rhythm of respiration. The following is an epitome of his conclusions regarding this matter: "When the subject was breathing an air charged with varying percentages of carbon dioxid, a rise of carbon dioxid of 2 per cent. increased the depth of respiration by 30 per cent. and the total alveolar ventilation by 50 per cent. A rise of 3 per cent. of carbon dioxid increased the total ventilation of alveoli

126 per cent., while an increase of carbon dioxid of 6 per cent. increased the depth of respiration 272 per cent. and the total alveolar ventilation 757 per cent."* Selig of St. Louis introduced carbon dioxid directly into the veins, and noted a marked increase in depth and rhythm of respiration. Lyon has noted a marked increase in both depth and rhythm of respiration as a result of rebreathing atmospheric air, while the writer has noted the same beneficial result in rebreathing oxygen and nitrous oxid, which is followed by no untoward results of any sort. These conclusions regarding rebreathing have recently been confirmed by Henderson in the *Journal of the American Medical Association,* April 11, 1914.

FIG. 5.



It is the belief of the writer, borne out by a considerable experience, that rebreathing is a distinct advantage, because (1) the increased percentage of carbon dioxid deepens and strengthens respiration, and (2) it enhances the anesthetic actions of the gases and is also an economy. The amount of rebreathing depends on the end to be gained. (See Fig. 5.) Whereas, for purposes of analgesia, full breathing demands three gallons of gas per minute, rebreathing demands but one and one-fifth gallons. This, however, leads me to the question of dosage, which has become more accurate as control of the gases has become more perfect.

The gas-pressure regulators absolutely control and equalize the flow of the gases, and are so delicately adjusted that even the variations of ounces of pressure by the gases are indicated and controlled and compensated by the regulators. Thus we are enabled successfully to standardize dosage, so that the proper dose of nitrous oxid and oxygen is now under far more perfect control than is the dose of chloroform or ether. For analgesia we may safely state that in all cases where the tidal air in normal breathing is 500 cc., and rebreathing is practiced—and it should be practiced for the reasons above stated—the gas proportions should be oxygen 20 per cent., nitrous oxid 80 per cent., and the dose or rate of flow one and one-fifth gallons per minute. For anesthesia, on the other hand, the proportions should be 6 or 8 per cent. oxygen to 92 or 94 per cent. nitrous oxid, the rate of flow three gallons per minute. If the flow of gas is cut down for the purpose of rebreathing, the oxygen percentage should be proportionately increased. For example, if a three-gallon flow containing 6 per cent. oxygen is cut to one and one-fifth gallons, then the oxygen should be doubled; that is, 12 per cent. oxygen instead of 6 per cent. should be administered, to the end that the respiratory center may at all times be sufficiently supplied with oxygen. Herein lies the real secret of success. This type of device electrically warms the inspired gases if so desired, and also enables one to administer ether by the drop method in combination with gas, when such a combination is advisable, which is, however, seldom necessary. In performing operations requiring exclusion of moisture during analgesia, the operator should apply the rubber dam, at the same time removing all saliva possible by means of the saliva ejector. Under the conditions just outlined, great care should be taken not to carry the analgesia into the anesthetic stage, because it at once robs the operator of the assistance of the patient in maintaining a proper position for speedy and successful work.

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* Starling's "Physiology."

HANDLING OF PATIENTS IN THE ANALGESIC STATE.

With such adequate apparatus, there is no difficulty either in producing or maintaining analgesia. The only difficulty which confronts the operator is the handling of patients in the analgesic state. In this undertaking, tact and the ability to inspire confidence are the two factors that make for success. The average patient will co-operate with the anesthetist, if properly instructed. In commencing anesthetization therefore it should be explained to the patient that he will not lose consciousness, if only analgesia is desired, and that he will be cognizant of the operation but will suffer no pain. He should be requested to inform the operator should he experience any discomfort, stating to him that if any pain is felt, the operator will carry the analgesia to a point where pain is entirely eliminated. In this manner the patient's confidence may be gained, thus greatly minimizing the *fear* of pain, which very often persists in the mind of the patient when pain itself does not exist. Under these conditions the average patient will remain calm; however, those with hysterical tendencies may be demonstrative to the point of rendering the operation impossible without carrying them into the anesthetic stage. To this there can be no objection, as anesthesia is as easily produced and maintained as analgesia, when once the anesthetist has become familiar with anesthetic symptoms.

In analgesia, if the anesthetic agent has taken effect at all, its tendency is to lessen the sensation of pain; and so, even though the operation is commenced before ideal analgesia has been produced, all pain will be diminished—to what extent it will be diminished will depend upon how far the anesthesia has progressed—up to the point where there is complete absence of sensation. If the operation has been painless, nothing is left to be desired, and even though ideal anesthesia has not been produced, the patient has been rendered a service in proportion to the diminution of pain. Comparatively few subjects fail of ideal analgesia with the perfect method we now possess.

SAFETY OF PROLONGED ANESTHESIA WITH NITROUS OXID AND OXYGEN.

Either analgesia or anesthesia may be prolonged indefinitely with safety, provided the gas is under such perfect control that the patient can at no time inspire more than just enough to maintain the desired state; and with correct apparatus, practically all patients may be successfully anesthetized partially or wholly for operations of any character.

Painless dentistry, so long derided by the public, is now an incontrovertible fact. The time has passed when humorists are justified in directing their witticisms at this ancient target.

Toxic Substances Which May Cause Systemic Disturbances and Which are Formed in the Absence of Specific Infection or Pus.

By W. STIRLING HEWITT, D.D.S., Philadelphia, Pa.

(Read before the Susquehanna Dental Association, Scranton, Pa., May 16, 1916.)

IN studying the problem of oral sepsis in its relation to systemic and constitutional symptoms, I have recently become aware of the fact that there are many conditions about the oral cavity which are not in themselves primarily infective, but which may often be the cause of obscure diseases. The study of these conditions, their chemistry and possible channels of dissemination, has led me to believe that a more thorough knowledge of the subject might be of value.

In our study of oral sepsis and its constitutional expressions, the principal causes of such manifestations are found to be pathogens, their toxins, endotoxins, and other poisons. We have been made fairly familiar with these bacteria and protozoa, their physical and chemical characteristics, and the means of recognizing the different known species. We are also familiar with their mode of attack and the symptoms caused by their toxins.

We have begun to accept as a truism that if none of these organisms are present and if there is no pus, we can give a negative report. We have neglected to take into account these "other poisons" which are vaguely mentioned, and it might be well to find out exactly what these substances are, how they act, their nature, their chemical properties, and under what circumstances they are formed.

When bacteria were first suspected as a possible cause of disease conditions, it was supposed that a group of substances known as ptomains were the means or media by which the symptoms were caused. At that time these substances were studied very carefully, but it was soon found that while some of these bodies were highly toxic, they did not produce the characteristic symptoms of the disease in question.

FORMATION OF PTOMAINS.

The investigators of that and subsequent periods found that while some organisms had very definite chemical affinities, yet the formation of the ptomains did not vary so much with the specific organism as with the varying composition of the media and the surrounding conditions such as temperature, light, presence or absence of oxygen, etc. It was then discovered that the bacteria formed an enzyme, which always remained constant and true to the species no matter under what conditions or in what media it was grown. These enzymes—called toxins when excreted and endotoxins when liberated upon the destruction of the cell—were found to produce the characteristic lesions and symptoms of the disease. The chemical composition of the toxins has never been determined, but their action is similar in many ways to enzymes with which we are all familiar, such as ptyalin, trypsin, and many other ferments. The ptomains, on the other hand, are of known chemical composition, usually of nitrogenous and protein origin, and their toxic action is definite and may be compared to that of the vegetable alkaloids. The toxins will cause the formation of antibodies or antitoxins in the blood and tissues, which will neutralize the action of the toxins. The ptomains, on the other hand, will cause no such phenomena, and immunization against them is impossible.

As an illustration of the difference between these substances, the diphtheria bacilli will always produce diphtheria toxin, but the ptomains which are found in the media will vary with its composition, etc. These ptomains are either the result of the digestion of the media leaving a residue of split-up proteids or they are waste products of bacterial metabolism. With the discovery of toxins as the cause of specific lesions, the study of the toxic action of many of these ptomains was neglected, except by some few investigators, therefore in studying these substances we come upon much uncharted territory which would repay exploration.

TOXIC SUBSTANCES PRODUCED IN METABOLISM.

I find that many of these substances are not always the result of bacterial action—may, indeed, be formed in living tissue as the result of faulty metabolism, either local or general. They may be formed in the sterile autolysis or self-digestion of tissue cells; many of these substances are highly toxic. The substances known as leucomains, which are found in diseased living tissue, are precisely the same chemically as the substances known as ptomains, which are the result of decomposition by bacterial action. There is a close analogy between bacterial metabolism and cell metabolism, both being simple cells and chemical units. The difference between ptomains and leucomains merely indicates a difference in origin rather than in chemical structure.

These ptomains are normally formed in healthy tissue cells as a result of normal metabolism, but in such conditions the chemical reactions are so perfectly balanced that each toxic substance is destroyed as quickly as it is produced, until the final simple non-toxic substances of complete metabolism are formed. If, however, there is a break in this chain, if the progressive chemical action is interfered with, we have then some of the leucomains left uncombined. This upsets the whole scheme, for the other normal cells have to make an extraordinary effort to reduce these toxic substances to non-toxic ones, to the detriment of their own metabolism. If the irritation is continued we have then established a local or general faulty metabolism with all its attending ills.

PATHOLOGICAL CONDITIONS IN THE MOUTH THAT ARE NOT OF BACTERIAL ORIGIN.

Let us now see what conditions may arise in the mouth which may cause such pathological changes, and which are not specifically bacterial in origin.

I wish to place first, pathological dentition, including impactions and overcrowding; lesions of the gums such as mechanical irritation from faulty occlusion, bad approximal spacing, pressure of bridges and plates, and the irritation of calculi both salivary and serumal; lesions of the pulp, including slight irritation, hyperemia, pulpitis, calcareous degenerations, liquefaction, fatty degenerations, gangrene, etc., and to consider the infection of these parts with non-pathogenic bacteria, which produce neither pus nor specific toxins, but which by their chemical reactions may produce ptomains. I have excluded the pathogens as outside the domain of the present subject, except as to their ptomain-producing properties.

The first effect of these slow, chronic irritations is in the alteration of normal metabolism and the establishment of faulty chemical cell processes. That these processes may be slow is a fact with which every practitioner is familiar. It will frequently take ten years for a faulty crown to cause the death of a pulp, and the gums will often withstand an irritant for from five to thirty years before true pyorrhea is established. As to whether or not enough toxic substances are found in such conditions as to cause constitutional lesions I cannot answer positively, but I think we have sufficient evidence to assume that it is entirely possible, and more than likely.

SYSTEMIC CONDITIONS PRODUCED BY DENTITIONAL DISTURBANCES.

I could point out many profound lesions that are observed in infants as the result of dentitional disturbances, particularly with regard to the effects upon the nervous system and the alimentary tract. Every practitioner has observed cases of pulpitis where the profound systemic symptoms could not be accounted for by pain alone.

The complaint patients usually make about acute odontalgia is that they can stand the pain, but it makes them feel "sick all over" and very nervous. Dr. Mershon showed me a case where he had cured a chronic chorea of four years' standing by removing a deciduous molar that had been wedged in between the permanent bicuspid and molar. The ophthalmologist can point out the profound symptoms caused by faulty refraction, a purely mechanical lesion, and we are all familiar with the constitutional symptoms of mechanical displacement of the uterus. We are all familiar with the systemic symptoms of acute dental lesions, and our attention has been called from time to time to cases where chronic painless conditions have been known to cause general reactions.

Furthermore, the recent research into the constitutional effects of oral sepsis, which has proved that even slight areas of infection can produce the most profound changes in distant organs, should make us hesitate before claiming that because the local manifestation of a disease condition is slight or painless we need not consider it.

TOXIC SUBSTANCES RESULTING FROM FAULTY METABOLISM.

The first and most interesting substances that are the result of faulty metabolism belong to what is known as the cholin group.

Cholin. Cholin is normally present in the cell nucleus in combination with other substances forming the lecithin of the normal cell. This substance is very readily separated from the large lecithin molecule even in conditions that are not purely pathological. It has been found in muscles that have become fatigued, and by some observers has been considered as one of the chemicals causing that reaction.

Cholin may be found in the normal cerebrospinal fluid, but in very minute quantities, and in large quantities in blood and cerebrospinal fluid in such conditions as nerve degeneration and during convulsive seizures in general paralysis, tabes dorsalis, and epilepsy. It may be liberated from any nucleated cell as the result of irritation, degeneration, or inflammation.

Cholin has also been suspected as being the toxic substance which causes many nerve lesions, for if it is injected into the cortex or under the dura mater it is extremely toxic, causing severe tonic and clonic convulsions. As cholin is readily oxidized into neurin and muscarin, I shall consider these most interesting bodies.

Neurin and *muscarin.* Both of these substances are highly toxic and have a similar reaction on the body, muscarin being slightly more toxic than neurin.

Muscarin is identical with the muscarin which is found in poisonous mushrooms, and like this substance has for its antidote atropin. When taken internally the lethal dose is ten times as much as when injected subcutaneously. It would be interesting to know the effect of minute doses of this substance injected at intervals over a long period. Subcutaneous injection of from 1 to 3 mg. of muscarin in man produces salivation, rapid pulse, reddening of the face, weakness, depression, profuse sweating, vomiting, and diarrhea. In lethal doses respiration ceases before the heart stops in diastole. Just before death violent clonic convulsions occur, and the peristaltic action of the intestines is heightened to such an extent that continual evacuation occurs.

The fact that some change in the chemical reaction of a slightly diseased part may cause the oxidation of the mildly toxic cholin into the highly toxic muscarin and neurin may account for the sudden violence in the physiological symptoms without any very marked change in the local condition, for these substances are not locally irritating. In such conditions muscarin and neurin have been obtained from the urine, showing its origin in some fault in metabolism.

The symptoms of neurin and muscarin poisoning are very similar to the pathological manifestations of abnormal dentition—*i.e.* salivation, vomiting, rapid pulse, weakness, depression, diarrhea, and convulsions. I may be perhaps going a little too far in making this statement, but I think you will recognize the possibility.

Betain, the fourth member of this group, has but slight toxic properties. There may be more substances of this character but they have never been isolated.

Purin bodies, or the uric acid group, have as their base the substance purin, which possibly in some form is a normal part of the cell substance, and in the cell metabolism forms a group of bodies which terminate in urea. The toxicity of uric acid has been the storm center for endless discussion. Whether it has or has not toxic properties, its constant presence indicates a chemical fault with its attendant ills.

Xanthin is very much the same in action as caffein, with which it is closely allied chemically. In small doses it acts as a muscle stimulant, and in large doses it produces muscular rigor and paralysis of the spinal cord.

Adenin is derived from the decomposition of nucleinic acid, and may be found in any diseased tissue rich in nucleated cells; owing to the destruction of leucocytes in leukemia it has been observed in the blood in such conditions. Adenin is a powerful poison, and when injected subcutaneously induces increased heart action and rapid death. It affects the digestive tract and kidney, causing constant vomiting, and upon the kidney its effect is seen by the presence in the urine of casts and albumin. Locally it has a coagulating effect on muscle tissue similar to that produced by heat or cold.

Hypo-xanthin is another substance similar to caffein, and when injected subcutaneously is found to have no action upon muscle, but it acts upon the nervous system, causing increased irritability and tetanus. The effect on the kidney is marked diuresis.

Guanin, owing to its insolubility, has little physiological effect, but is readily convertible into more toxic substances like xanthin. Pathologically it occurs in the muscles, ligaments, and joints of swine suffering from the disease known as guanin gout.

Para-xanthin, injected into the muscles in doses of from 1 to 2 mg., produces almost at once rigor mortis of the part affected, with diminished reflex excitability following a previous increase of reflex excitability. In lethal doses dyspnea is an early symptom, but as soon as rigor sets in respiration drops below normal. The physiological effects of this substance remind one very strongly of the symptoms of pathological eruption of the third molar.

You will observe that most of these bodies act upon the central nervous system, the muscles, and the kidneys.

Pyrimidin substances are closely related to the purin group, and by some are regarded as the antecedents of this group. The pyrimidin bodies constitute normally a part of the normal nucleinic acid, but when combined with di- and tri-amino acids are highly toxic.

Hexon bases are products of nuclear metabolism, more especially of nucleinic acid, and are closely allied to the protamins and histons. The chemical reactions of these substances are obscure. The toxic properties of the protamins and histons are very definite, and when injected subcutaneously cause severe local inflammation and necrosis. When injected intravenously these substances cause death in a few minutes. The physiological action of both the protamins and histons is to produce changes in respiratory movement, fall in blood pressure, retardation of coagulation, agglutination of the corpuscles, together with decrease in leucocytosis.

Creatinin and *xantho-creatinin,* of the creatin group, in fairly large doses produce depression, somnolence, and extreme fatigue accompanied by vomiting and frequent defecation.

There are many other unidentified substances formed in the body which may produce toxic action. Some produce local action, such as lactic and sarcolactic acid, phosphoric acid, and fatty acids. These acids reduce the combining power of the blood with carbon dioxid by reducing its alkalinity. What is principally interesting to us is that we have good reason for supposing that these acids have the power of precipitating earthy salts from the blood serum. A more thorough knowledge of the chemical actions of these acids would throw much light on the subject of pyorrhea and similar disorders.

TOXIC SUBSTANCES FOUND IN DEAD ORGANIC MATTER.

I shall now consider the substances which are found in dead organic matter such as would be encountered in the putrefaction we find in root-canals and pyorrhea pockets.

Many of these substances I have already considered as leucomains, for such substances are frequently encountered in putrefaction. We may imagine our root-canal is either sterile and the putrefaction has occurred as a result of the action of the proteolytic enzymes of the cell, or it has been infected with non-pathogenic organisms having proteolytic properties.

Infection with pathogens, while most usual, is outside the scope of this paper. Most of the substances that are found in such a condition vary with each case, and so many factors are involved that each root-canal produces different reactions. The most marked difference is noted in the presence or absence of free oxygen. If oxygen is present the decomposition is rapid, and few toxic products are formed.

The amino acids which are present in normal proteids, and combine and recombine as decomposition progresses, have few toxic substances among them, but when they are combined with other substances, as before noted, such as the purin, pyrimidin, histon, or protamin groups, they assume importance.

Putrescin and *cadavarin,* two substances belonging to this group, while they cause no systemic symptoms, when injected into the tissues cause local necrosis and at times aseptic pus. This is of particular interest in the treatment of root-canals.

The members of the aromatic group are old acquaintances, for we all recognize them by their odor when we open into a putrescent root-canal.

Indol, the first of these, of which much is known, has been pretty carefully investigated in relation to intestinal toxemias. When indol is absorbed from the intestines it is converted by the liver into the comparatively harmless substance indican, in which form it is found in the urine. The presence of indican as revealed by urinalysis is considered proof that there is present intestinal auto-intoxication.

The tissue cells also have the power of converting indol into indican, but in limited quantities. It is necessarily abnormal, and long-continued irritation of this substance would result in cell degeneration. Herter found that the administration of .025 to 2 grams per day of indol to healthy men caused frontal headache, irritability, insomnia, and confusion, while continued absorption is sufficient to cause neurasthenia.

Indican present in the urine is the sign of indol absorption, possibly from decomposing material in such conditions as putrid cancer, purulent discharges, and gangrene.

Skatol is in many ways similar to indol, usually accompanies it, and possibly causes similar symptoms.

Phenol, which is carbolic acid, in large enough quantities will cause symptoms of carbolic acid poisoning.

Cresol appears chiefly as para-cresol, and in post-mortem examinations may be confused with morphin, it having similar reactions—showing the affinity of many of these substances with the vegetable alkaloids.

As many of these substances are powerful antiseptics, a very curious situation may arise in putrescent root-canals whereby the contents may be sterilized. This has its good points in that no more specific toxins are formed, and on the other hand, these substances are not broken down into simple and less toxic bodies by the action of bacterial enzymes. A study of this phase of the situation might modify some of our ideas on the use of antiseptics such as carbolic acid.

The continual absorption of these substances by the surrounding tissues so lowers the resistance of the tissues that we have a periapical area ready for any infection. The formation of gases is not without interest in these cases, especially where we have a closed cavity, the mechanical action of their formation forcing the contents of the cavity more deeply into the periapical space. The principal gases thus produced are hydrogen, hydrogen sulfid, methane, nitrogen, ammonia, and carbon dioxid. Hydrogen sulfid causes destruction of the red blood corpuscles. Carbon dioxid causes acidosis of the blood plasma, reducing the carbon-dioxid-combining power of the blood and other reactions. Venous blood in such cases is a brilliant scarlet in color.

There are many more substances the properties of which, while interesting, time does not permit me to dwell upon. A thorough familiarity with the properties and physiological action of these substances will often furnish a clue in the search for oral lesions that may cause constitutional reactions.

CONCLUSIONS.

In conclusion, I would like to point out that many of these substances cause kidney lesions, as shown by albumin casts and abnormal urine content; that they will also produce nerve disturbances, causing chorea, epilepsy, twitchings, muscular tremors, and contractions and irritations of the sensory nerves, etc.; they will bring about such mental conditions as depression, somnolence, and confusion, and are capable of producing many violent and chronic disturbances of the digestive tract. That the disease reactions that are considered the result of puberty are coincident with the eruption of eight bicuspids, four canines, and four permanent molars, with all the chances of impaction producing faults in metabolism, is significant!

Therefore we as dentists should consider not only infection, but mechanical irritation in its relation to systemic reactions.

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[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

The Structural and Other Changes Arising in Connection with Metals Used in the Mouth.

By GUSTAV HEDSTRÖM, Stockholm, Sweden.

(Report to Section IV, Sixth International Dental Congress, London, 1914.)

METALLOGRAPHY, or the science of metals and their alloys, is entirely the outcome of the researches of recent years, and has advanced with the development of physical chemistry. In this report the subject is dealt with only in so far as it concerns the art of dentistry, and is limited, further, to the essential features of amalgamations—this being, indeed, the part of most importance to dentists.

ALLOYS.

Taken as a group, alloys in their formation and behavior follow universal laws; therefore I feel obliged to refer to those laws, so that the following statements may be understood by those not directly interesting in this sphere.

Definition of an alloy. When we ask, What is an alloy? What is its nature and its complete definition? we are compelled to reply that science has not yet come to an agreement that would justify a complete definition.

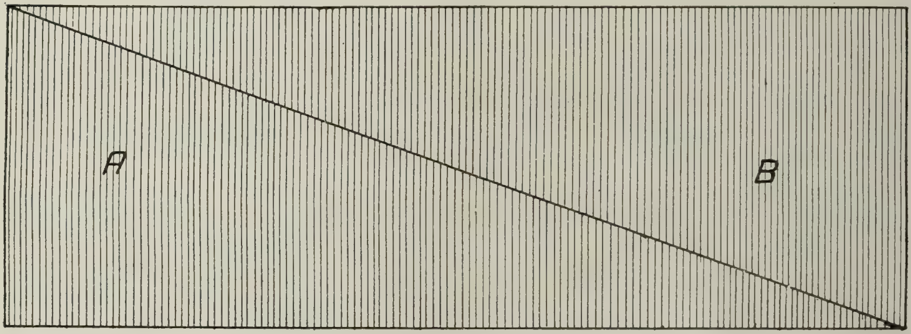
In 1893 Kasmann made the following statement: "We cannot define what we consider as an alloy, and all 'alloys' in which chemical impurities can be proved to exist should forego the name of alloy. A mechanical blending of two or more metals takes place in different ways." The English word "alloy," the French word "alliage," is equivalent to a mechanical mixture. Guerther in his work "Metallography" (1909) has given a more modern and it would also seem a more complete definition: "Alloys are blendings or mixtures of any kind which arise through a union of dissimilar metals, of indefinite number and in any proportion or quantity." He further states: "In addition to this, it is of no consequence whether the two metals in any alloy be found united as a chemical union or in any other combination, and to what extent."

This definition appeals to one as being sufficiently wide, as those metals can be brought under our conception of an "alloy" which are capable of entering into combination with another metal or even with non-metals without destroying the metallic peculiarity of the alloy; as for instance, the alloying of metals with the elements antimony and bismuth, these being now classed next to metalloids, such as phosphorus, sulfur, coal, etc. Other elements which stand even more remote from true metals can also enter into a metallic alloy without the alloy losing the physical properties of a metal, such as metallic luster, high specific gravity, malleability, and conductivity for heat and electricity. There is, however, a great difficulty in drawing a sharp line, and in doing so, at once a great uncertainty arises between metals and the metalloids; many elements bordering on and being classed at present as metalloids, when raised to a high temperature present the characters of true metals.

As is known, there are different methods for producing an alloy. When two metals are melted separately and we mix them thoroughly by stirring, they can be made to form a *homogeneous body;* one of the metals has dissolved itself in the other, and we have obtained what we shall term a *homogeneous smelting*. Or another condition can be found, resembling a mixture of oil and water, and one of the bodies is found floating above the other, the two finally separating if allowed to stand for some time. In such an instance, applied to metals, we say that they cannot be alloyed with each other.

Some metals again, which can absorb only a small quantity of another metal, leaving the rest untouched, after the manner of the emulsion, supply an instance of still another condition. To this group belong silver with manganese, iron, cobalt, and nickel; sodium with magnesium, zinc, and aluminum. But far more conspicuous are the closely related thallium, lead, and bismuth alloys, through their tendency to separate from each other in two different layers when melted together with such metals as zinc, aluminum, iron, manganese, and silicon. The latter group is, however, limited in number, whereas all other metals when fluid can be alloyed under all conditions.

FIG. 1.



FOUNDATION PRINCIPLES OF METALLIC ALLOYS.

The foundation principles for all metallic alloys are—

(1) All metals and alloys crystallize on congelation.

(2) The alloy formed by two metals when in the solid state consists either of one kind of crystal only, or of two different kinds; there is an exception to this rule, however.

(3) Crystallization follows the same laws as are valid for all other mixed bodies. Every alloy, even if it should present a smooth surface and an apparently amorphous appearance as in glass, nevertheless consists of crystals lying close to each other, either homogeneously, as for example in marble, or heterogeneously, as in granite. No alloy so far has been found with amorphous components.

USE OF THE MICROSCOPE IN THE STUDY OF ALLOYS.

Modern metallurgy now makes use of the microscope, which has proved itself to be an important assistant in the study of alloys. Micrography has undertaken to study the primary nature of alloys, or, in other words, the least perceptible quantity of the alloy components. Suppose we take the metal A, forming the main component of an alloy, and add smaller quantities of another metal B to form the other component of the alloy; by studying the cut surface of such an alloy under the microscope we can in some instances distinguish particles of A being forced more into the background until they disappear finally in B.

In the diagrams the horizontal lines indicate the degrees of concentration of the two metals; starting-point, 100 per cent. of A with 100 per cent. of B. If we divide the vertical lines discretely, and with constant intervals, we have in Fig. 1 a graphic representation or a picture of a grading preparation of alloys of various percentages in composition of A and B as visible in the microscope.

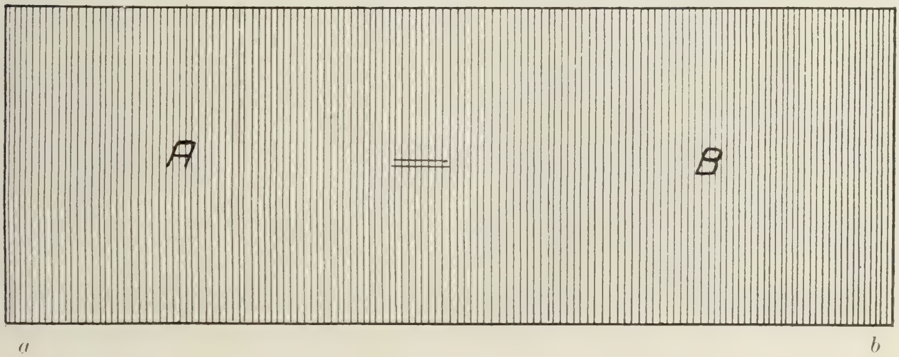
The alloys of this type consist of specified metals mixed with each other but each *unchanged* in the alloy; such blendings are called heterogeneous mixtures. As can be seen, the alloys do not differ essentially from the original metals, but show the same physical properties as the components as to hardness, specific gravity, color, conductivity for heat and electricity, and reaction to acids. These alloys, however, present no features of interest to our science.

CRYSTAL FORMATION IN ALLOYS.

Differing from this is the case with metals which after melting and setting show under all conditions the same form of blended crystals; the alloys of gold and silver have long been known as examples of this. A smooth cut of such an alloy etched with a suitable acid always shows the same kind of crystal, no matter what may be the relative quantities of the dissimilar components.

Original crystals of A, in spite of the addition of B, must continue to occupy the same places as those of B, which has been made clear in Fig. 2, through the quantities of both metals being expressed in concentration, in such a way that the lines of altitude are unbroken in their whole length.

FIG. 2.

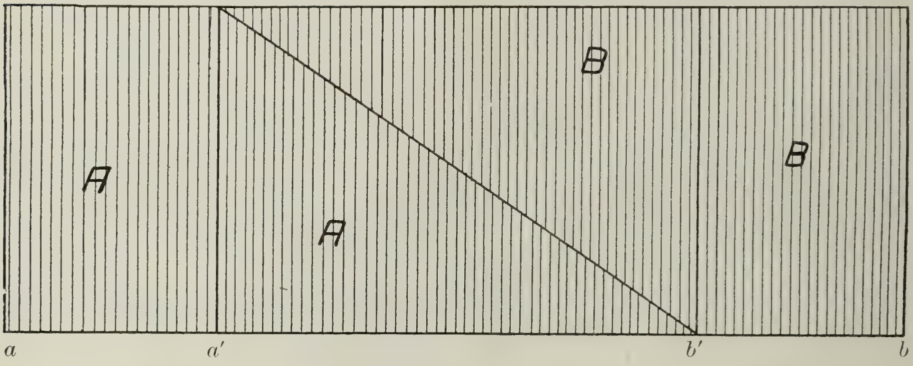


Apart from the two cases described, others more complicated can arise. Let us suppose that the metal A fills the picture with microscopic fields of pure A crystals, and after the addition of largely increasing quantities of B, the first layer of the ground section shows the same picture notwithstanding. The additions of B have been absorbed in a form of isomorphous blending in the large crystals. On the addition of a certain percentage of B, which may be quite large, we see a new form of crystal arise among the large original ones. This new crystal grows until it covers the whole surface with increasing degrees of concentration, and ultimately A disappears. From *b* to B, all alloys show uniformly one kind of crystal only, and that of form B. The concentration of saturation of the blended crystals are the concentrations *a* and *b*. Between these a blending interval arises.

As long as the concentration after the addition of B to A remains below *a*, B is absorbed by A in the blending crystal, but as soon as the concentration of saturation has been reached at *a*, any further addition cannot be absorbed in the crystal, and by means of the microscope we now find present a new component unlike A. The new body has the composition of *b*, for when the original metal is saturated with B, so this again in turn saturates itself *vice versa* with the former, as soon as it begins to appear independently of A.

The case is analogous to the results obtained by bringing together two fusible but dissoluble bodies in the molten state and limited in each other, in which case so long as the two fusible components occur simultaneously side by side they become saturated with each other. With further additions we always obtain the blending of the two components with the composition of *a* and *b*. The relative quantities of this kind of crystal are clearly shown in Fig. 3 by the right-angle A B bisected by the diagonal. Not until the concentration of *b* has been reached can the other form of crystallization B change its composition, and by continuing the addition of the other metal it finally goes over from *b* to b^1. The third example thus described is by far the most common, so that it may be described as the original type. The instance where on alloying two metals a new form of crystal arises is of peculiar interest. Lead and magnesium melted together disclose in the alloy a crystal of a steel-blue color, and long needles of fine form. If exposed to the air for some time, the alloy decomposes into a black powder, thus appearing as an entirely new body, which possesses none of the characters of either lead or magnesium, both of which metals are unaffected by contact with air.

Fig. 3.



Suppose we add small successive quantities of lead to magnesium, according to the law already stated, that every metal added to another to a certain percentage is absorbed by that other to form the blending crystal. The same change occurs with the first addition of lead to the magnesium crystals. Saturation is reached with only a small percentage. If we still continue adding lead, we ultimately find the blue crystal referred to above with no free magnesium present.

An alloy of two metals can never have more than two different forms of crystals. On addition of B (Fig. 4) to the original metal A the new form of crystal C occurs. This is effected by B combining with an equivalent quantity of A to form the new crystal C. Under no circumstances can B and C melted together occur simultaneously with crystals from A. Should this be the case, however, the system does not become void, but tends to change after some time in such a way that the one form of crystal is excluded with the occurrence of the new crystal C in the alloy, its number of lines indicating the quantity increased by continuing to add lead. The lead, as it is added, combines with an equivalent quantity of magnesium to form the blue crystal. By continuing to add lead it occupies more and more volume in the alloy, as expressed in Fig. 4 through the relative lengths of the vertical lines.

If the concentration C is reached, the

whole volume consists of blue crystals. On increasing the additions of lead after the lead has ceased to be absorbed in the crystal C, the lead occurs in the form of crystals of the composition of B, this crystal containing magnesium in increasing quantities. Finally, between the concentration b and b^1 are found crystals with ever-decreasing contents of magnesium, until chemically pure lead occurs.

Fig. 4.

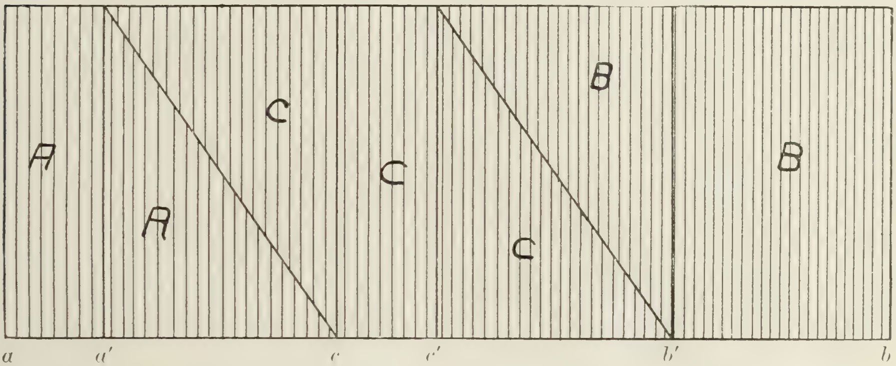
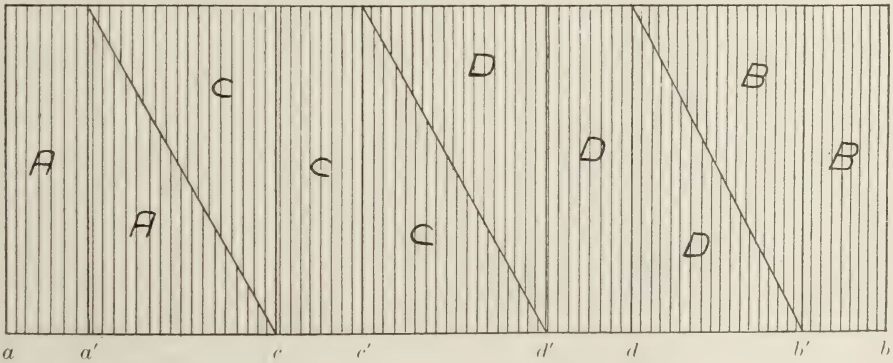


Fig. 5.



The most important general points of view are—If in an alloy of two metals a new form of crystal occurs on the addition of the second metal to the first, so the same form of crystal occurs on adding the first metal to the second; and, further, there is always a concentration sphere to be found in which the new form of crystal appears alone. This sphere on Fig. 4 extends from c to c^1, exactly in the same manner as the original form of crystals occupy the sphere a–a^1 and b–b^1. According to which metal of the form of crystals C is added in the greater quantity, we get a blending of the new crystal C with either A or B, while the other metal disappears. In most cases the sphere is absorbed alone by the new crystal C to less than 1 per cent. The percentage of combination in question is most frequently a single form in accordance with the atomic weight of the two primary metals. We consider this form of crystallization rightly as a chemical combination. As in the example just given—lead and magnesium—the composition of the steel-blue crystals corresponds exactly with the formula Mg_2Pb, which is rightly considered as a chemical combination. The newly formed crystals cannot be calculated upon, and are the cause of the numerous unlooked-for results which we encounter in alloying, causing the investigations of alloys generally to be of the greatest possible interest. When the crystals are brittle and friable they may impart the same property to the alloy.

Now, it can also occur that besides the three crystals already referred to, another, a fourth one, D, is found. In all cases, however, the same law holds good, namely, that only one or two kinds of crystals can occur simultaneously in an alloy. When the addition of B to A exceeds the limits of saturation of the blending crystal at a^1, C reappears, and as the quantity continues to increase at c it fills the whole body of the alloy. It is not until c^1 has been exceeded, and A has completely disappeared for some time from the alloy, that the new crystal D is seen to appear. Its quantity increases while C decreases, and at d^1 completely disappears. From d to d^1 we have only one kind of crystal D, and it is only when the point d is reached or exceeded that B is observed in increasing quantities. Again, in a simple manner, by making a section between b and b^1 and between c and c^1, we can make the whole process of alloying quite clear in detailed sections. These relations are not subjected to any radical change if later a fifth, sixth, or seventh form of crystal occurs in the alloy. At present, the highest number of crystals observed is eight.

This is all of inestimable value to the technical investigator. If we know, for instance, when new forms of crystals occur in the process of alloying, then it is quite sufficient to know their qualities in order that we may calculate all other degrees and concentrations which are lying between. For instance, we have made the following observation: A small quantity of silicon added to nickel yields the alloy silicon-nickel. If we add a small quantity of pure nickel, the nickel absorbs the silicon crystals, resulting in a considerable increase of hardening of the metal. We have every reason to hope that, through a still greater content of nickel, a still harder alloy may be obtained, suitable for tools, machinery parts, etc. As we know in the meantime that nickel and silicon yield four new kinds of crystals, and that these crystals are all so brittle that they can easily be ground to powder, we can, therefore, refrain from laborious attempts at experimenting through their long list of alloys of dissimilar percentage.

In the foregoing, I have kept close to Guerther's "Metallography," and I desire to take the further liberty to quote from his remarkable work the following:

> We thus know that the crystalline constitution of metal alloys is far from simple, but if, on the contrary, they are built up in an extraordinary manner, they notwithstanding allow themselves to be reduced to four simple questions:
>
> (1) What crystals occur in the special chains of alloys?
>
> (2) What are the physical and chemical properties of the metallic alloys? (Although these properties cannot be determined beforehand, yet we know that the formation of new varieties of crystals is connected to a large extent with an increase of brittleness.)
>
> (3) How far in the special part diagram—which we obtain through dividing the diagram by a line through the new form of crystal—does the sphere for blending crystals extend, and how far the sphere for the heterogeneous blending of the two different varieties of crystals?
>
> (Suppose we have fifty metals, to be nearer the truth. For 1500 metallic alloys, we obtain 2500 binary systems. It would require much time to experiment upon all of them for the sake of research, but already the first universal rule begins to disclose itself as the result of the systems investigated up to the present time.)
>
> (4) In what manner do the unequal properties of metal alloys change in relation to the proportion of the two primary or starting metals—first, in the chains of blending crystals, and secondly, in the quantity of the crystals.

We have now, we hope, partly made clear the laws governing the binary alloys. As it is known that most of the alloys consist of more than two component metals, we refer to them as tertiary, quaternary, etc., alloys, where three, four, etc., components enter. It has, in the meantime, been discovered that the laws governing them group themselves in very convenient form, and with unimportant deviations from those governing the binary alloys.

THE EUTECTIC.

Before we proceed to construct a metal diagram it must be clearly understood what we understand by a eutectic—generally accepted as the lowest melting-point alloy of a series. The Swede Rudberg, in Upsala, as early as 1829, found what he termed double melting-points. Melt A and B together, A being in excess, and the setting-point is lower in the alloy than for A and B taken separately. Solid blending crystals are deposited from A and B in the alloy, although the quantity deposited from B is less than from A. In this manner the alloy becomes richer in B, and in this way the melting-point sinks still further in a small degree, until at the end we are left with a eutectic residue, which sets at a constant temperature, and which is described as the eutectic temperature of the alloy.

We have now seen that various changes of a chemical and physical nature can occur through external influences. In cases where such influences occur and they compensate each other, the condition remains unchanged, and we say that the system is in equilibrium. The changes occur quickly at high temperatures, and so slowly at low temperatures as to be hardly noticeable. Rapid change is a function of the temperature, and at the usual practical point, without being exact, is represented as equal to 0.

We have also previously referred to a homogeneous system, that is to say, when all insoluble molecules consist of the same chemical components and exhibit the same physical character. Such a condition, of course, is not found in the non-homogeneous or heterogeneous system. Following Gibbs, we term its coexistent gaseous, liquid, or solid state as a phase in the heterogeneous system. If the coexistence of the phases, also of each special phase, is entirely stable in itself, we speak of "heterogeneous equilibrium;" whereas the unchangeable characters of a system formed from a special phase indicates an example of homogeneous equilibrium. The unequal phases occur and disappear at unequal temperatures. In most instances there is no distinctly noticeable transition from the molten state to the crystalline, which as a rule occurs at the usual temperature. The crystals disappear before they come into contact during the increasing temperature of the liquid phase—the other appears again intermediately. We must have this clearly apprehended, otherwise the so-called "state" diagram cannot be fully understood.

The three phases, which at the unvarying temperature of the system of equilibrium react upon each other, can be either smeltings or crystals. The instance where all three phases occur liquid has not been observed so far, and the possibility of such occurrence is most unlikely.

From this the following possibilities arise:

Two liquid components = one form of crystal.
One liquid component = two forms of crystal.
No " " = three forms of crystal.

In connection with this, in the diagrams, we refer to the temperature horizontal lines in their system of equilibrium as biliquidal, bisolidal, or trisolidal. (See diagrams, Figs. 6 and 7.) There are various combinations and transitions in the system of equilibrium, but a statement of these would greatly extend this paper, and therefore, we refrain from introducing it.

TIN-MERCURY.

The state-diagram was worked out in 1903 and 1904 by Puschin and by Van Heteren.

The diagram at first sight appears very simple, and the melting-curve as an almost direct slanting line from a 100-atom percentage to 10, at which point it bends down sharply to −39° C. The diagram has become complicated owing to Van Heteren's discovery of the two changes of tin and of an intermediary kind of crystal. As the metals tin and mercury are of such practical importance to us, we must overpass for a moment the limits allotted to them.

Fig. 6.

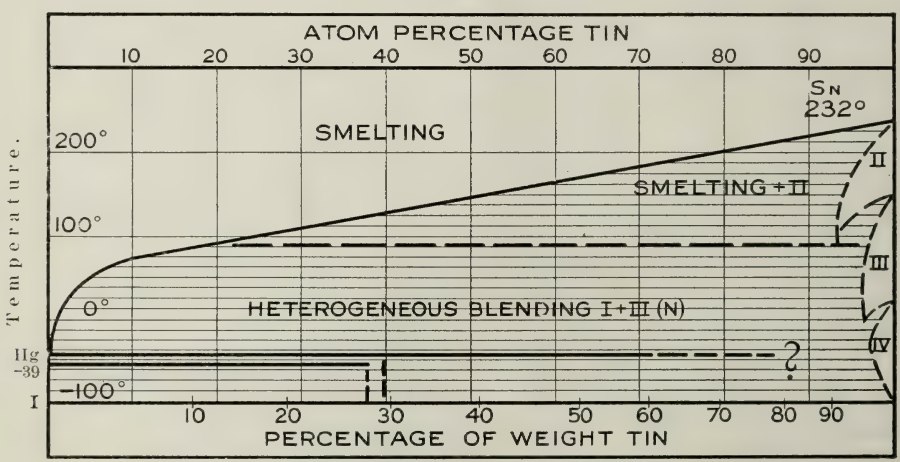


Diagram of *state* of tin-mercury alloys.

Through various measurements it has been established that besides the temperature horizontal line at about −40°, there are two more, a peritectical at −34.6° and a eutectical at −38.65°. With regard to the liquid components, there must be between the two homogeneous temperatures, almost corresponding to their two equilibrium horizontal lines lying closely above each other, one peculiar division of liquid components, which corresponds directly to the offput of the intermediary form of crystal from the smelting. And in fact the existence of such a division has been established. Tammann first investigated the melting-point of mercury with a small addition of tin; Van Heteren repeated the same within an accuracy of 0.05°. He discovered with an addition of tin of 0.3 atom percentage the peritectal horizontal line at −34.6°. Here a distinctly provable interruption and a change of a distinctly thermal effect—noticeable up to the present with a smaller content of tin—occurred in the liquid components. It was not noticeable in the other division, this being very vague. The offput of the division corresponds with the intermediary kind of crystals. According to the researches, harmonizing with each other, of both authors, one division, which should produce crystals of mercury is so entirely absent that in each case it cannot extend over a hundredth of a degree. Here we have an example of the most perfect case known up to the present of a form of transition between both forms of the equilibrium horizontal lines. Another glance at the diagram shows us the heterogeneous blending of tin up to a 29 weight percentage, and a 20 atom percentage; the melting-point is close to 100°. It has not been made clear so far; although theoretically conceivable, that the modifications of changes of tin have the same conditions of solubility in mercury.

Through the researches of Puschin, it

has been made clear that in all solutions of mercury up to 80 atom percentage, the same six-rayed crystals of tin are to be found as primary secretions; which means that in this whole sphere of concentration a single type of crystal stands in the equilibrium with the liquid phase.

With regard to the solidal curve we must take into consideration that we have to deal with two, perhaps three, different modifications of tin, each entering singly into contact with the smelting. The explanation of this is still very problematical.

Fig. 7.

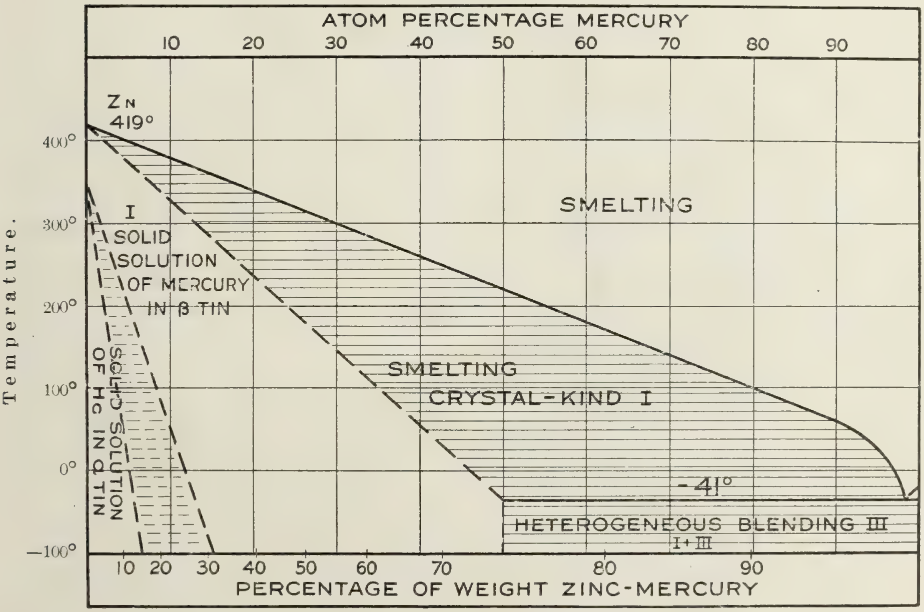


Diagram of *state* of zinc-mercury alloys.

The occurrence of the solubility and of the crystallization at the ordinary temperature have been accurately studied. Van Heteren separated the liquid from the solid through centrifugation 2–3 minutes at 2400 revolutions per minute, and at 16°. He found at different trials a residue of 62.8, 65.22 weight percentage of tin. Naturally there was found a small remnant of mother-lye. The best result, 68.68, corresponds to 78–79 atom-percentage of tin. But it must, however, be noted that Van Heteren himself has succeeded in obtaining up to 83 atom-percentage Sn, free of mercury. The other system, as described by Van Heteren, has been employed after the method of Bancroftska. He added to a known quantity of cadmium, known quantities Sn and Hg; analyzed the liquid phase, and calculated from the result the entire quantity and contents of Sn and Hg, taking it for granted that all the cadmium was contained in the liquid phase. Through subtraction of Sn and Hg present in the crystal phase were found Sn in 95 atom-percentage. The condition of this result being correct is that cadmium does not occur in the solid tin phase, or in any yet known crystal phases in the blending. The value of 95 atom-percentage Sn is for usual room temperature, and this must be accepted, at present, as the very nearest. Trials of Merz and Weith as to how quickly, at different times and temperatures, mercury can be evaporated from a tin-amalgam, have given no clear result. At the conclusion of the chain of trials, in not one single instance was an Hg residue found, and it separates from tin crystals undoubtedly much more readily than from gold, silver, zinc, cadmium, and copper.

Unfortunately no trials at lower temperatures and constantly high temperatures have been made. Special experiments only confirm what has been said above; this will be referred to at the conclusion of this report.

Silver amalgam. This, according to Ogg, is soluble at 18° in 1 cm.^{3} 0.0062–0.0067 gram silver = 0.046–0.049 weight-percentage of silver. The figure deviates a little from that found by Merz and Weith, and can be regarded as quite sufficient. After filtration of the surplus Hg, although Hg could not be determined to adhere to the crystals, Ogg found the form Ag_2Hg_5. The examination of the compositions, which were exposed to strong pressure of a longer or shorter duration, have given, in 100 Hg, 33–51 Ag (Joule), 27 per cent. Ag (Dumas), corresponding to the formula Ag_3Hg_1, Ag_2, Hg with 36 per cent. Ag (Klaproth). In any case these trials show that the crystalline ground body in half liquid Ag amalgam must contain more than 36 per cent. Ag. On the other hand, from the composition Ag_2Hg, only a little deviation toward a somewhat higher content of Ag can occur. As a solid solution of Hg in Ag can hardly arrive at so high a content of mercury, without doubt we have here to do with an intermediary form of crystal.

Recent investigations have established the fact that mercury is retained with remarkable tenacity by the silver crystals—the same is the case with gold. Souza has drawn up tables, which lack of space forbids inclusion here. According to the result so far attained, it has been determined for the time being, with regard to the constitution of Ag amalgams, that at least one intermediary form of crystal of the formula Ag_3Hg_4 occurs, although there is a greater richness of Hg; further, that Ag is able to absorb more than 10 per cent. Hg in solid solution at 300–500°.

Gold amalgam. The gold amalgam is rich in Hg at usual temperatures in the liquid condition. As elsewhere, it is only the analyses of liquid phases that are useful, as we cannot separate through filtration the metal-crystals from their mother-smelting. Goery, in 1895, found at the usual room temperature a composition of the liquid phase containing 0.13 per cent. gold. As early as 1848 the composition of the *solid* phase had been studied by Crookenwith, and since then by a number of other investigators. The results have differed very much according to the different methods. Formula $AuHg_2$ (Crookenwith), Sonnenschein (1854) Au_2Hg_3. Finally Fay and North (1901) stated that through centrifugation of Au amalgam through a leather bag, we obtain a stationary residue of the composition Au_4Hg. This should induce us, perhaps, to consider the last result as the most nearly correct, as it can be assumed that the way in which we arrive at it is the most complete elimination of the liquid phase.

According to this result, the ground mass had only a small Hg content, and was considered more as a solid solution of mercury in gold than as an intermediary form of crystal.

Petrenko, 1906, has with infinite pains studied the zinc-silver alloys, and established a complete state-diagram. Alloys, up to 21.7 weight-percentage of tin, are still homogeneous with the I form of crystal. As zinc in our amalgams, together with silver and tin as the principal means of correction of colors, etc., occurs in small quantities only, the zinc-silver alloys of the higher contents of Zn do not interest us here. We shall refer to Zn at the conclusion of this report.

Cadmium-silver. The form of crystal eliminating at a temperature of more than 224° is a solid solution of cadmium in silver up to 37 per cent. Cd. On decreasing the temperature the degree of solubility sinks between 30 per cent. and 34 per cent. Cadmium is employed in small qualities, 2 weight-percentage at the utmost, for the color-correcting of gold-cadmium amalgam.

Gold-cadmium. Solid solution of Cd up to c : a 18 weight-percentage of gold with the form of crystal *i*. At a higher content of Cd a number of other forms of crystals occur. (State-diagram worked out by Vogel.) Alloys of a lower percentage of zinc occur principally in the hard solder for correction of color. It is most interesting to observe the respective smelting-curves in the diagram, although space does not admit either its reproduction or discussion.

Here only the binary alloys which form the foundation of alloys with more than two components have been dealt with. If we take fifty metals, and from these take two alloys and count only those which do not differ from each other in the composition below 1 per cent., we obtain 120,000 alloys. We must try to find in this chaos a definite direction, and this is briefly a statement which, after many trials, I have endeavored to make.

In the October number of *Deutsche Monatsschrift f. Zahnheilk.*, 1902, the writer of this report introduced an article on "Apparate und Methoden zur Untersuchung der physicalischen und chemischen Eigenschaften der Amalgame." When I began these investigations it was my intention to find out how it compared with regard to the volume of some amalgams, the changes and also the chemical qualities and their relative strengths. Investigations with a dilatometer and a specially constructed micrometer fixed to a microscope have shown that we have to face questions concerning the changes of volume and form. The sensitiveness of the dilatometer was 3 m.m. on the dilatometer scale =0.1° on the Celsius thermometer. The volume of one of the scales of the balance went up to 0.099 19 m.m.^{3}. The micrometer showed 0.0025 m.m.

The first dilatometric investigations showed that the porosity of the amalgams is exceedingly great; therefore different means must be resorted to in order to complete the investigation as desired. We shall refer later to the porosity. All chemical and other physical influences being debarred, no change of volume could be observed, and the dilatometric investigations of amalgams of the following types are:

Alloy 1.

50 weight-percentage Ag
50 " " Sn
Hg 0.75: 1 alloy under rubbing and kneading to plasticity.

Alloy 2.

68 weight-percentage Ag
32 " " Sn
1.5 " " Zn
Hg 0.8: 1 alloy.

Alloy 3.

50 weight-percentage Ag
48.6 " " Sn
1.2 " " Cd
0.2 " " Ph
Hg 0.75: 1 alloy.

The same result has been obtained by investigations with the micrometer; for the rest, the conditions have been the same in the course of the trials. These trials have been repeated and confirmed, and a trial with the alloy 3 showed during a course of almost ten years no change in the dilatometer.

At my first trial the dilatometers were filled with water, colored by anilin to enable a clear reading. Some hours after the depositing of the amalgam in the dilatometer, bubbles of air arose around it, the quantity of water decreased considerably, gases collected and escaped in the upper part of the dilatometer. In one of the dilatometers an amalgam containing copper decomposed simultaneously with the anilin dissolved in the water and was found lying in the sediment as a dark brown powder. The original color was a brilliant red. It was made clear to me through this that the chemical change had probably taken place simultaneously with the amalgam absorbing the water. I altered a sensitive analytical scale into a hydrostatic one in order to study more closely the interesting conditions of porosity. Thus it was easy to find the quantity of the absorbed humidity, and I take the liberty to reproduce here the following table, taken from my lecture at the Nordiska Naturforskare Congress, at Helsingfors, 1902:

TABLE SHOWING THE RESULTS OF SOME HYDROSTATIC TRIALS WITH AMALGAM.

Trial.	Weight of amalgam in grams.	Volume amalgam in cm³.	Temperature of amalgam.	In the amalgam is cm³ water. Days.	Penetrated per cm³ amalgam.	Pressure in trial per cm³ amalgam in kilograms.	Name of the amalgam-alloy.
1	2.2388	0.2128	15° C.	12	0.043233	23.496	Crown.
2	2.3048	0.2193	—	12	0.01368	22.80	Svea.
3	2.3108	0.2231	—	12	0.017481	22.411	Skandia.
4	2.1414	0.2088	—	6	0.009814	24.534	Skandia, extra contour.
4	2.1414	0.2088	—	12	0.012758	24.534	“ “ “
5	2.4334	0.2278	—	12	0.025461	21.945	Silver alloy with copper (Forssman).
6	2.2429	0.1925	—	12	0.066493	25.974	Copper amalgam (Forssman).
7	2.1026	0.2090	—	11	0.011962	23.918	Alloy III. C.
8	2.1072	0.1212	—	11	0.029703	41.255	Contour (Flagg).
9	2.1396	0.2010	—	5	0.01592	24.875	Gold-amalgam (Herbst).
9	2.1396	0.2010	—	9	0.01592	24.875	“ “
9	2.1396	0.2010	—	11	0.01592	24.875	“ “
10	2.2226	0.2176	—	11	0.024357	22.978	Submarine (Flagg).
11	2.8377	0.2516	—	11	0.025835	19.873	True Dentalloy, S. S. W.
12	1.8124	0.1724	—	10	0.017981	29.002	Imperial amalgam (Ash).
13	2.3534	0.2360	—	10	0.026695	21.186	Century (Gilbert).
14	2.1282	0.2155	—	10	0.02645	23.203	Mixed metal-polishing with 50% copper (Witzel).
15	2.3074	0.2120	—	10	0.06132	23.585	Fellowship (C. de Trey & Co.).

The constant porosity of water, according to Qwineke, is 7.449, or at its climax 7.235 at 25° C. That of the saliva is a little less, varying according to its content of mucus. In the trial No. 6, a distinct chemical reaction took place simultaneously with the absorption of the water, causing copper carbonate to be formed. Besides this a brown coat was visible, probably cupric oxid, CuO_2. The experience of the dentist teaches us that a piece of copper amalgam after having been in the mouth for a year presents an entirely different appearance from one which for the same period has been wrapped up and kept in a paper envelope. If we polish the latter piece and put it in an airtight compartment, we shall find that it retains its changed appearance. Thus we see that we have to deal with the amalgam problem in a different way from that which has been employed up to the present, if for practical purposes we wish to gain the results for which we are looking. The changes which we observe in the modifications of volume and form are chemical occurrences, caused by the agents to which the amalgams are exposed. If a piece of amalgam be inclosed in a dilatometer intended for gases, we shall find there the same disturbances as in the humidity-dilatometer. The structural changes to which our amalgams are subjected in the mouth are caused by the chemical agents residing in the cavity of the mouth. Therefore we must first study the origin of these, and their effect upon the different metals. As is known, the saliva of man, besides water, contains matters which are, from the point of view taken in this essay, very important—*e.g.* diastatic enzyme—traces of albumin alkaline chlorids, compounds containing sodium and phosphate of magnesium, bicarbonates of alkalis, and calcium, and also a very little alkali sulfocyanate Where there are certain foodstuffs in the mouth, saliva, enzyme, and bacteria, certain products of fermentation and other products of decomposition arise. According to Flügge, carbonic acid, valeric acid, palmitic acid, acrylic acid, crotonic acid, glycolic acid, lactic acid, valerolactanic acid, oxalic acid, succinic acid, leucin, glycocoll, glutinic acid, asparazinic acid, amidostearic acid, ammonia, carbonate of ammonia, sulfate of ammonia, sulfureted hydrogen, and others.

On adding a very small quantity of cadmium to an amalgam alloy, and after this alloy has been exposed only a few days to the mouth liquid, we find on the piece of amalgam a golden coat, consisting of cadmium sulfid, which precipitates from the acid solution of sulfureted hydrogen. The same is the case with an amalgam containing zinc; a milk-white coat of zinc sulfid is formed, which is readily soluble in a great number of acids. Here we have a typical example showing how an amalgam can be destroyed in the mouth. Thus gradually the soluble zinc sulfid is washed away, and the lower parts of the amalgam are acted upon in the same way.

Besides this, we have to take into consideration the mercury evaporation—for, as we have already stated, various metal crystals with varying tenacity retain the mercury absorbed in the form of crystal.

The lines for continuing the investigations in this widely extended sphere, as can easily be understood, surpass those that have been stated. It will be noticed in this report, which is intended chiefly as a reference, that in its first part it deviates considerably from its title—"The Structural and Other Changes Arising in Connection with Metals Used in the Mouth"—but I wish to point out that we must necessarily look for help from modern metallography if we are to reach the standard for which we are striving, and our introduction gives possibly the shortest account with regard to it.

Pyorrhea.

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IN as infinite variety as the colors in Joseph's coat are the words and phrases suggested the more correctly to describe our old familiar enemy, pyorrhea alveolaris. What's in a name, after all? The term pyorrhea has fairly established itself, and is already familiar to the lay world. If to the public mind it only conveys thoughts of a flow of pus, so much the better in an age in which we are preaching oral prophylaxis and the horrors following its neglect. Pyorrhea is so common that it gives one constant and eloquent opportunity to dilate to patients upon the serious results of oral sepsis, and we must retain a title that conveys far more to the lay mind than many more elaborate phrases, if we wish to get the best results in our prophylactic campaign.

CLASSIFICATION OF PYORRHEA.

For ourselves the term is quite sufficient if we but simply elaborate it with such a classification as I now wish to suggest, viz:

Pyorrhea of 1st degree.
" " 2d "
" " 3d "

In my own practice I have used this classification for my own satisfaction for some years, and find it a great help. I distinguish the degrees in this manner:

Pyorrhea 1st degree. I place every simple gingivitis, however slight, in this group. It may be a general marginal condition or one affecting but a few teeth, or it may be but a patch glazed and rolled back from the cervical margin of a single tooth, or a congested interdental fringe.

Pyorrhea 2d degree. A more marked gingivitis, more tendency to bleed, calcific deposits, and slight pocket formation.

Pyorrhea 3d degree. Marked destructive stage with decided pocket formation and pus in evidence, recession of gum, involvement of bone and looseness of teeth, much calcific deposit, and marked congestion and irritation of gingival tissue.

I do not mean to say that every gingivitis, however simple, marks a condition of pyorrhea, but I do claim that every gingivitis, however simple, is a potential pyorrhea, and should be so regarded. And it is well to remember that pus is there much earlier than the eye can detect it. The great difficulty in the treatment of pyorrhea has been the want of early recognition of the trouble. Such a classification as I have outlined would induce men to keep a weather eye open, and by early recognition and treatment it would prove one of our greatest prophylactic measures.

ETIOLOGY.

As regards the etiology of the condition, I am convinced that it is always of local origin, with the one possible but very doubtful exception of a gouty deposit acting as an exciting cause. Systemic conditions no doubt play their part by lowering the vital resistance of the gingival tissues, but the many coexistent systemic conditions are more often due directly or indirectly to the pyorrheal sepsis than they are in any way themselves a causative factor. The lowering of the resisting power of any particular section of the gingival tissues is also, I believe, generally of local origin. Such lowering forces are to be found in any condition which interferes with thorough cleansing of the tissues, such as sensitive teeth, overcrowding of the teeth, malocclusion with its impairment of function, and again, the pressure effect of calculus and the places of lodgment it affords for septic matter. If for any of these or other reasons cleansing is interfered with, pyorrhea may establish itself.

Around the teeth there is a certain amount of gingival border which is unattached, and in the unclean or imperfectly cleaned mouth fine particles of food pack under this border and between the teeth, and a septic condition is and must be the inevitable result. The margin becomes irritated and pyorrhea 1st degree, a gingivitis, is in evidence. Still neglected, the transition to the 2d and 3d degrees is all too easy, with every hour adding to the septic condition and further lowering the resistance. Does it not seem fatally sad not to have attacked that simple gingivitis while it was simple pyorrhea of the 1st degree instead of waiting for it to assert its full and awful fury in the 3d degree? How often have many hundreds of miles of our beautiful forest lands been laid waste by a fire that might have been extinguished under the tread of a single foot in the beginning had anyone realized the damage it was likely to cause if allowed to go unchecked! In this connection I am reminded of the lines of a song in an old comic opera, "Why not begin at the beginning, If you would win what is worth winning?"

AMŒBÆ.

There is still much research work to be done in connection with the bacteriology of pyorrhea. Various micro-organisms have from time to time been claimed to be those most frequently found in pyorrheal lesions, but no single micro-organism has been definitely isolated as that responsible for pyorrhea. Though Smith, Barrett, Bass, and Johns are very positive as to the presence of the endamœba in all pyorrheal lesions and are equally positive as to its pathogenic character, their claims must yet face the test of much further clinical evidence and independent research work. The amœbæ alone in the oral cavity offer a large field for research workers, and some may yet definitely be proved to be pathogenic as claimed by Smith, Barrett, Bass, and Johns. I shall have occasion to refer again to this question when discussing treatment.

MOUTH INFECTION AND SYSTEMIC DISTURBANCES.

Once a pocket is established there is no doubt that the infection is a mixed one, though the conditions of growth may favor one micro-organism and cause it to preponderate in that particular case, while in the next it may be conspicuous by its comparative absence. Thus it is, I fancy, that so many different micro-organisms are described, and I have for a long time inclined to the belief that in those cases in which we have similar systemic disturbances—*e.g.* rheumatic arthritis—we find the micro-organisms similar, or similarly grouped, to those which preponderate in pyorrheal lesions. Further, in what I may call this selective influence will be found, I believe, the key of many systemic diseases.

Such a theory is not so imaginative as it might appear at first sight. In all mouths will be found germs which are capable under suitable conditions of becoming pathogenic, but which are kept under control by the degree of resistance and immunity of the tissues of the oral cavity. Lower that resistance sufficiently in the gingival margin or elsewhere, and the micro-organism waiting for and capable of taking advantage of the opportunity will jump at the path of lessened resistance so created, pouring its offspring and toxins into the body, and systemic effects will manifest themselves just as soon as the body finds difficulty in destroying the particular poisons so absorbed. I do not wish to be understood as saying that all systemic diseases are due to septic absorption, or that where they are present the septic focus is necessarily in the mouth; but the probability of the existence of a septic focus in many systemic diseases is very great, and it is highly probable that if such a focus exists it will be found in the mouth or adjacent parts.

Long ago Hunter attributed pernicious anemia to oral sepsis, and I have heard eminent physicians argue against that view by saying that they had seen cases of pernicious anemia in which all the teeth had been lost some time previously. A condition necessitating the loss of all the teeth was surely in itself strong proof of the previous existence of a severely septic condition in the oral cavity. Today we are beginning to look upon septic conditions of the nose, accessory sinuses, throat, and mouth as very strong causative factors in goiter, and as likely to cause a general disturbance of the thyroid function. And how far-reaching that may prove will be better appreciated a few years hence, when the function of the thyroid is more thoroughly understood. In rheumatic conditions, dyspepsia, and other intestinal affections, inflammatory conditions of the eye, and a host of other troubles, how often have we seen a marked improvement follow the clearing-up of a pyorrheal condition!

Where a pyorrheal condition has long existed I fail to see how the tonsils can escape infection, and probably even after the pyorrheal condition has been cleared up, the tonsils remain an unsuspected source of continued infection.

If a 3d degree pyorrheal lesion exists, be it but a single pocket, there is constant drain of pus into the mouth, and this is swallowed with the saliva, not to mention absorption through the tissues around the pocket; and to all this must be added a pouring-out of the collected or residual pus on pressure such as obtains in mastication—so that the threshold of the alimentary canal is simply a septic cavity tainting all food supplies, in addition to pus being absorbed or swallowed!—yet we marvel at the improvement of a systemic condition on clearing up a pyorrheal source of infection.

TREATMENT OF FIRST DEGREE CASES.

Having assured ourselves that the condition is one of pyorrhea, be it of the 1st, 2d, or 3d degree, we must search for the possible cause. A brief history of the case should be obtained from the patient, as this is of importance both in the matter of diagnosis and treatment, remembering that different parts of the mouth may exhibit the disease in different degrees. Having now carefully considered the condition and history of the case, it is next necessary to map out our plan of treatment.

The first essential in the successful treatment of any condition is the removal of the cause, if that cause can be found. It was recognition of that principle that made the brilliant Dr. Bonwill suggest the corundum wheel as a cure for pyorrhea, that being his graphic manner of suggesting malocclusion as a cause. Though the methods of treatment advocated are so many, they are not so different after all, for they each aim at the removal of the cause, destruction of pus-forming micro-organisms, and promotion of a healthy reaction in the affected tissues. But to some of the means suggested to obtain these ends I must take violent exception. A mild escharotic action may be useful in stimulating and cleansing the pockets after scaling and polishing the teeth, and for this purpose sulfuric acid, 25 per cent., trichloracetic acid, 25 per cent., and, lately, tartasol (bifluorid of ammonium) have been used. If used at all it should be with care—and very *great* care—and their effects should be neutralized after a minute or two with sodium bicarbonate.

DANGER OF STRONG ESCHAROTICS IN PYORRHEAL POCKETS.

The flooding of pyorrheal pockets with tartasol and similar strong escharotics is to my mind fraught with very great danger to an affected tissue of already lowered vitality, and if you say you use it to dissolve tartar deposited in inaccessible places, I ask you to leave a tooth well covered in tartar in a bath of tartasol, and see how long it takes to bring about the desired effect, and while it is doing so picture to yourself the effect on the adjacent vital tissue. The effect produced is a destructive action comparable to that met with in the track of a bullet—a surrounding cell-death. Granted that for the moment we destroy the micro-organisms in the pocket being treated, are we not likely to greatly aggravate the pathological condition? We are supplying a pabulum of broken-down tissue for micro-organisms which may be in strong reserve in adjacent pockets, or free in the mouth, and with lots of time to bring up their reserves and develop in the crater we have formed with our high explosives, before nature has a chance to recover from the shock.

I take it that the idea originates from a procedure adopted in the treatment of ununited fracture—treatment by the injection of irritating fluids, with a view to exciting inflammation. The fluid is injected as nearly as possible between the broken ends of the bone, the only break of skin being the valve-like puncture track of the needle, and with the excitation of inflammation it is hoped that callus-formation will be stimulated. Are the conditions comparable? I hardly think so. I may also say that even with an ununited fracture the trouble may be a local lowered vitality as the result of the general health being below par, a condition which may not only permit of scanty formation of callus, but may even cause the absorption of callus already formed. In syphilitics the administration of mercury or iodid of potassium may cause a speedy union. Ericksen records a case of ununited fracture in an incipient phthisical patient which united well after a course of cod-liver oil and good diet. And if it is possible for impaired nutrition to prevent union of a fractured limb, it behooves us not to overlook the constitutional side of treatment in pyorrhea.

IMPORTANCE OF EARLY RECOGNITION.

I lay greatest stress upon an early recognition of the symptoms in the treatment of pyorrhea, hence my suggested classification of 1st, 2d, and 3d degrees of pyorrhea. The earlier the recognition the more successful is the treatment likely to be, and I cannot better emphasize that principle than by quoting from an article in the *British Medical Journal* on "Gunshot Wounds" by Sir Berkeley Moynihan:

> Lister clearly distinguished the difference between the prophylactic and the therapeutic value of antiseptics; he emphasized the all-importance of the former, and pointed out the inadequacy of the latter. The work of surgeons since Lister taught has depended for its almost incredible success upon the prevention of infection in wounds deliberately inflicted, not upon the control of an infection already established.

With that fact in mind let me plead for early recognition of pyorrhea, which simply means that we examine carefully the gingival tissues in every mouth in which we work. In cases of 1st degree pyorrhea nature may demand but slight assistance, and it is usually sufficient to remove any cause of irritation, such as salivary calculus, ill-fitting crowns, bridges, or mechanical appliances, and to fill any cavities in the teeth. Restore the normal masticating surfaces as far as possible and obliterate any spaces favoring lodgment of food between the teeth. If these procedures, with instructions as to thorough cleansing of the mouth, prove insufficient, painting the gum margin twice a week with tincture of iodin is effective, but the best treatment I have yet found is ionization with a 2 per cent. solution of sulfate of copper. It has in these cases given me better results than zinc.

TREATMENT OF SECOND AND THIRD DEGREE CASES.

In cases of the 2d degree slightly more severe treatment may be necessary, but the actual method of treatment will depend so largely upon the individual case—as it also will in cases of the 3d degree—that I shall as briefly as possible discuss the different treatments I find most satisfactory, and where possible indicate when certain lines of treatment are called for in preference to others. Upon one point I think we are all agreed, and that is in the removal of all deposits from affected and unaffected teeth, and the more I have to do with pyorrheal conditions, the more convinced am I that in proportion to our careful and thorough instrumentation with correct instruments will success mark our efforts. In this thorough instrumentation we rid the pocket of an irritant and clear it of much of its débris and micro-organic life. The clot fills the space and the gum quickly becomes firm and seals the mouth of the pocket, protecting it from further infection, and giving the clot time to organize and heal the pocket. That at least is frequently the very gratifying result. The firmness of the tooth must of necessity be principally due to fibrous union and to the establishment of general firmness of the more healthy tissues around the damaged socket.

The bone is always much involved, a rarefying osteitis, and where the periosteum is absolutely destroyed it is difficult to imagine how fresh bone formation can take place. Where the periosteum is still in existence the rarefied bone in its neighborhood no doubt recovers its density, and helps to tighten the tooth. I understand that Dr. Sydney Smith maintains that the pocket is between pericementum and cementum, and that the periosteum is not destroyed. Even then the amount of destruction of the periosteum will depend upon the severity of the lesion, and in advanced cases I fail to see how it can altogether escape.

INSTRUMENTATION.

In regard to instrumentation I take strong exception to the ruthless sacrifice of gum and bone tissue, as I deem it an unnecessary and harmful procedure. We seem too apt to run to death any one method of treatment, and to test it far beyond fair and normal limits. In regard to devitalization, I have heard Dr. Rhein state that he believed in it and attributed its beneficial action to the fact that the blood stream of the pulp is diverted to the pericemental vessels. I think that the amount of blood so diverted, if any at all, is infinitesimal, and that if any good result is obtained it is probably due to the drugs used in the canal exerting their effect on the pocket around the tooth. But I prefer a live tooth to one devitalized.

Where I remove a heavy marginal deposit of tartar I swab the raw edge, to relieve the pressure effect it has had on the gingival margin, with tincture of iodin, and do not polish the tooth surface until that edge is again in a healthy condition, say, forty-eight hours later. I never use any powder in the pockets themselves, for the reason that much grit is liable to remain and irritate the tissues. The pockets are washed out with a saline solution before clearing them, leaving the clot undisturbed afterward. Both alone or in conjunction with other treatment I have obtained excellent results from ionic medication.

IONIC MEDICATION.

Leduc, Lewis Jones, Ernest Sturridge, and a few other enthusiasts, have of late years stimulated the interest of the medical and dental world in the subject of ionic medication, and its results are so encouraging that one readily becomes an enthusiast in regard to the treatment. The layer of coagulated albumin formed by the contact with the tissues of such drugs as zinc salts is no longer a barrier to their absorption, for the zinc ion can be made to penetrate to any desired depth.

Used in this manner the zinc ion exerts its antiseptic effect, conveyed by the current to depths and parts impossible to reach by any form of irrigation. Zinc seems to be the metal of choice, and is used in solutions of from 3 to 5 per cent. of the chlorid or sulfate. Copper sulfate in 3 per cent. solution I also use frequently, and in cases of 1st degree pyorrhea I prefer it to zinc, but it is often good treatment to use them alternately. Silver salts likewise give good results, and a 2 per cent. solution of iodin is often useful. A platinum electrode may be used, but I prefer to use one of the metal I am treating the case with, *e.g.* copper or zinc. The advantage of this is that if the solution is exhausted we still keep up the bombardment with copper or zinc ions, as the case may be.

I believe in obtaining as close contact as possible with the parts I am ionizing. I generally pack a fine twist of cotton, carrying the solution, into the pocket with an excess projecting, then I either apply the electrode to the cotton or place a pad of gauze of 12 to 15 folds saturated with the solution over the projecting cotton, and apply the electrode to the pad. Cotton rolls are useful to keep the saliva out of the way. I treat each pocket or margin from two to eight minutes with a current as strong as the patient can comfortably stand, which is anything from 3 to 10 m.a.

In cases of acute pyorrheal abscess I use the zinc ions in this manner for quite fifteen to twenty minutes. For successful results we depend upon a thorough penetration of all portions of the affected tissues. This involves considerable time and current and some patience, but our patience is well repaid by the results obtained. For about an hour after ionizing the tissues there may be slight discomfort to the patient, but this is never great, and is quickly followed by a sense of benefit. I frequently paint the gums with tincture of iodin or argyrol (20 per cent. solution) after ionization, in order to lessen the discomfort to the patient.

The length of the gauze pad varies with its purpose. For a pocket it is only about half an inch square, but for use along the gingival border it may be long enough to treat a considerable portion of the gum at one time. Mr. Withycombe has recently shown me a tin-foil cap lined with lint carrying the solution which can be readily adapted to either arch. He applies his electrode to the foil, and so treats the whole arch at once. This ingenious method of treatment I think may be very good after instrumentation to prevent reinfection and to stimulate the tissues, but for strictly ionic medication I certainly consider a closer contact with affected parts necessary.

EMETIN HYDROCHLORID TREATMENT.

The use of emetin hydrochlorid recalls Dr. James Truman's early treatment by packing the pockets with quinin. The similarity of action of the two drugs would account for the successes in his treatment, in view of the work of Smith and Barrett and Bass and Johns. Emetin has given me such excellent results in several cases that I consider it a very valuable addition to the drugs used in the treatment of pyorrhea. Sometimes it has failed me and sometimes its results have been almost dramatic. Sometimes, injected intra-muscularly, it has acted well, and in other cases local use has produced better results. Combined with treatment by ionic medication it has given me good results. Occasionally the injection into the arm—I generally inject into the deltoid muscle near its insertion—is followed by some soreness, a small hard lump persisting for some days. In one case the injection apparently irritated a cutaneous nerve, as an herpetic eruption appeared. In the majority of cases, however, I have not had any disagreeable results. The local soreness may be in great part avoided by kneading the site of the injection to disperse it more rapidly. I always sterilize the skin before the injection. Do not use emetin in the case of an alcoholic, if you wish to avoid nausea, etc.

Another precaution necessary is to avoid the use of emetin, even locally, during the menstrual period, as it is likely to check the menstrual flow. Just how it acts in that manner is difficult to explain, but emetin is a drug the therapeutic possibilities of which are not yet thoroughly understood, and I can only refer in this connection to its similar striking results in hemoptysis as reported by Flandin to the Medical Society of Paris Hospitals, and published in *Le Monde Medical.* I know that many dentists have already abandoned the use of emetin because they apparently have not obtained the expected results in every case, and their doubt as to the pathogenicity of the amœba has thus seemed to be confirmed. On the other hand, I think Bass and Johns lay too much stress upon the amœba as being alone responsible for pyorrhea. We might cite dysentery as a parallel example in medicine. If all cases of dysentery were treated with emetin alone the drug would fall into disrepute. The reason for this is that we recognize two forms of dysentery, amœbic and bacillary, and the particular form present must be diagnosed before the correct treatment is decided upon.

May not one form of pyorrhea be due to a pathogenic amœba? I venture the opinion as a result of many successes with emetin. But I emphasize the fact that instrumentation must be a part of the treatment. Occasionally I have obtained good results in an obstinate pyorrheal pocket with a paste of hydrargyri iodidum viride and glycerin packed into the pocket, and then leaving a twist of cotton saturated with glycerin in the pocket for a few hours. The benefit of this treatment I attribute first to the antiseptic power of the drug, combining the action of iodin with that of mercury, and second, to the glycerin inducing an osmotic flushing of the pocket with fresh serum. As the dose is only from 1 to 3 grains, care must be exercised in using hydrargyri iodidum viride.

Where a pocket persists in spite of all treatment we should be sure that a dead pulp is not adding to our difficulty, or, if in the upper jaw, that the pocket is not connected with the antrum, as in the cases reported by Underwood in the *British Medical Journal.* Immobilization of a loose tooth is helpful if the method used does not involve impingement on the gums or favor lodgment of food débris. All hopeless teeth should be extracted.

I prefer vaccine treatment where any systemic effects of the pyorrheal condition are in evidence. Here, again, vigorous local measures should be used at the same time, for it seems unreasonable to leave a septic and irritating mass about the teeth and expect good results from a vaccine. I prefer to use a mixed autogenous vaccine. Vaccine treatment and the use of glycerin locally seems to me an ideal method, for we are thus flushing the pockets with fortified serum.

SYSTEMIC TREATMENT.

Systemic treatment should be directed to increasing the resistance of the individual and counteracting the effect of pus that has been swallowed but not destroyed. Constipation should be avoided in all cases of pyorrhea, for any stagnant condition of the intestinal tract will make it an easier prey to invading organisms and their toxins. In this connection I would like to quote a short paragraph from a paper I read before the Dental Graduates of Victoria in 1913, as published in the *Commonwealth Dental Review:*

> In pernicious anemia about all that is definite is that there is a marked diminution in the number of red blood corpuscles and yet a high percentage of hemoglobin, and to this latter fact Colman attributes continued life even when the red corpuscles are greatly reduced. Now, why this great reduction? What has happened? Hunter, I think, got very near the solution when he expressed his belief that the destruction occurred in the portal circulation, and was due to the action of some poison absorbed from the gastrointestinal tract.
>
> I venture to suggest the presence of a toxin which by an osmotic influence directly, or by its action on glandular secretion influencing the portal circulation, causes the bursting or breaking-up of the red corpuscles, just as you witness under a microscope blood corpuscles swell and burst, if placed in water or very dilute solutions of sodium chlorid; or if in concentrated solution of sodium chlorid, on the other hand, the corpuscles give up their water, contract, and break up.

In regard to the care and cleanliness of the mouth, I find that many persons will take more pains in brushing the teeth if you prescribe a particular brush and a particular paste. Show them how to massage the gums and give them proper mouth-washes. Most toothbrushes are too large. We should also insist upon patients' reporting regularly for examination.

In conclusion, I would only say that we have several very effective measures at hand with which to deal with this all-too-prevalent condition, and if we use these measures with judgment and *in correct support of one another,* success should crown our efforts in the vast majority of cases.

The Wrong Diagnosis in Orthodontia.

By Dr. CH. F. L. NORD, Gorinchem, Holland.

(Read before the Third National Dental Congress, Groningen, Holland, June 23, 1916.)

IN a paper on the value of biology to dental surgery (see DENTAL COSMOS for 1916, January and March) I pointed out, among other things, the importance of the knowledge of biological science to orthodontia. It did not lie within the compass of that paper to enter into details, but it is now my intention to point out to you a serious mistake that we have hitherto been making, which has led to serious consequences in the treatment of malocclusion of the teeth. In distinguishing the anomalies of the teeth from the normal standard —the "norm"—the rules laid down in Angle's work, "Malocclusions of the Teeth," which work I presume to be well known here, have been pretty generally followed of late years. It is adherence to these principles that, in my opinion, has led to ill effects in the treatment of tooth anomalies, and I shall attempt to prove this here.

I wish to state emphatically that it is not my object to detract in any way from the merits of Angle's work with regard to orthodontia. I merely wish to show you that since it has been proved that his methods in many cases have caused negative results, it is time to modify these methods. The great mistake in Angle's system lies particularly in the fact that he did not take the biological factors into sufficient account, and that therefore his system is not founded on a scientific basis, but on hypotheses prepared for that purpose, and not proved by any means.

THE "NORM."

I have just said that of late years Angle's rules had been followed in distinguishing the deviation from the norm, and here we have the immediate and principal source of the mistakes which have been made. What *is* the norm? In answer to this question Angle gives his well-known first molar theory, which is nothing but an hypothesis. His whole system being based on this hypothesis, it follows that the whole system is wrong if it should be demonstrated that the hypothesis is wrong. It *is* wrong—I believe this can be proved.

In order to make the first molar theory as acceptable as possible, Angle begins by stating that nature always strives after harmonic beauty, and that every deviation from this harmony is a somatic one and therefore to be remedied, and claims that if it be remedied in the way pointed out by him, failure is theoretically excluded. It is in my opinion expressing it very mildly to say that this "harmony" phrase is the greatest possible error. In biology we have hundreds of examples to the contrary, and I need mention but one instance—that of a child of two handsome parents, with fine straight noses, being born with a horrid turned-up nose. Though this may be called anything but harmonic, yet nobody will deny that it may and does occur, and this deviation cannot very well be called a somatic one.

To the question, What is the "norm" in orthodontia? there is but one answer, viz, A norm does not exist! That this is really the case is very clearly proved by Dr. J. P. Lotsy, who in his newly published works, "The Crossing Theory" and "The Present State of the Theory of Evolution," goes into the details of this question. In this respect we have to contend continually with the antiquated notions of the Linnean theory. At present, however, every botanist and zoölogist knows that in the species there exist numbers of "varieties" which are not really such, but are to be considered as separate species.

Linnæus supposed that all species are constant, and existed in their present form as early as the creation. Deviation from the type he explained through the influence of external circumstances, as light, heat, etc.

The experiments of Jordan, however, have shown indisputably that the Linnean *species* is not a unit, but a complex of units. After thirty years of experimental labor he proved that the Linnean species is nothing but a group, including several species.

Jordan inferred purity of species from constancy of seed. That this also is no sure criterion was proved by Mendel's researches, which proved that there are two kinds of organisms, pure ones that can form only *one* kind of breeding-cells, and hybrids which can form several kinds.

DEFINITION OF "SPECIES."

The species is therefore to be defined as a group of individuals of identical constitution that can form only *one* sort of breeding-cells. The descendants of individuals belonging to the same species are mutually alike, and like the parents. From this it follows that men do not belong to one species, because children are neither mutually alike nor like their parents. Every man is therefore a hybrid, and in consequence of this the children from any marriage may have all the qualities, either of the father or of the mother, or they may have *new* qualities, originating in the accidental influence of the parental hereditary units.

Any setting up of a norm in whatever respect is therefore wrong, for in mutually unequal magnitudes there can be no norm from a scientific point of view. If in future this truth is to be considered in every aspect much more than it has been hitherto, that will be the case in orthodontic questions.

HEREDITARY ANOMALIES.

If we return to malocclusions of the teeth, we notice in the first place that the teeth of the lower and upper jaws always match each other in character; and hitherto no set of teeth has ever been found—to my knowledge—where this was not the case. The same, however, cannot be said of the two jaws, as here deviations are frequently met with. A very striking instance of this is the prognathism of the Hapsburg family.

I shall not go into the details of the Hapsburg family, as a great deal of literature has appeared on this subject, but I will observe only that it has been indisputably proved that in this anomaly in the Hapsburg family we have to do with a scientifically proved hereditary anomaly.

In connection with this we refer to the publications of Professors Strohmayer, Galippe, Rubrecht, and Haecker, who with the help of the history of the Hapsburgs and their genealogies, and with the aid of the existing pictures, coins, and drawings, have shown that the protrusion occurring in this family is a dominant hereditary quality, showing the same chacteristics as other instances known in botany and zoölogy. There is therefore an anomaly in the usual proportions of both jaws which has been effectually proved to be not a somatic one; and that this anomaly caused by nature contributes to harmonic beauty not even Angle will assert, if he has ever closely examined the portraits of the Hapsburgs, particularly that of Charles the Fifth.

ANGLE'S THEORY OF CAUSE OF MALOCCLUSION WRONG.

With the establishment of this fact Angle's theory falls at once, and—to my knowledge—this dangerous point was never touched on either by Angle or any of his adherents.

As this hereditary anomaly occurs in protrusion of the lower jaw, it may be supposed that protrusion of the upper jaw may also be hereditary, and indeed this is no longer to be denied. It was originally my intention to show you here some models of remarkable hereditary protrusion of the upper jaw, but on second thought I refrain from doing so, because, in the first place, models alone do not prove much, and secondly, because I do not doubt for a moment that you have observed the same protrusion repeatedly in your own practice among different members of the same family—*i.e.* all characteristics of the teeth appearing regularly in the same family.

Every unprejudiced observer will now have to admit that where strictly hereditary anomalies of the usual positions of the jaws occur, one can never know whether or not the anomaly in a particular patient is really an hereditary anomaly, except, of course, in cases in which it is to be traced from easily discovered somatic disorders. It is perfectly sure, then, that Angle's entire theory with regard to natural harmony has fallen with the acceptance of this fact, and that by his method we try to force nature, which in most cases will lead to undesirable results.

The first question that we usually ask patients with anomalies of the teeth is, How is the condition with the rest of the family? Often there are similar anomalies, and sometimes there are not. In the former case we are apt to take a pessimistic view with regard to the results to be obtained; but in the latter we generally think that we have to do with a less serious case. This in my opinion is not at all the proper attitude. When an anomaly in the proportions of the two jaws is met with that is not to be classed among those arising from somatic disorders—neglect of the teeth, extraction, sucking of thumbs, adenoids, etc.—this anomaly is undoubtedly *inherited,* that is to say, the result of the sum of parental hereditary elements.

TYPE AS THE GUIDE IN CORRECTING MALOCCLUSION.

In looking for the same anomaly in parents and other members of the family it is too often forgotten that there must some time or other have been a primary case, which may occur again at any time—indeed, does occur. In this case we cannot properly speak of it as an anomaly, but we have to do with a particular type, which very often gives a characteristic peculiarity to the face, and which no one would like to see changed. If we force these cases in a fixed, theoretically prescribed direction, we commit as great a folly as we would if we should try to change a turned-up nose into a Grecian one by a certain apparatus. Not only do we run the risk of the esthetic result being anything but satisfactory, but it seems *a priori* very improbable that, without an operation, such unnatural compulsion could have any permanent results.

It would seem that where a fixed scheme of treatment cannot exist, treatment according to an indefinite scheme would in many cases lead to negative results. In other words, the treatment as pointed out by Angle, and according to which splendid results are promised, would in reality, according to the theory advocated by me, in many cases lead to the wrong treatment, and therefore to unsatisfactory results.

PERCENTAGE OF FAILURES UNDER THE PRESENT METHOD.

In order to verify the above theory as applied to actual practice, I requested Dr. van Loon to estimate the average number of failures occurring in the treatment of malocclusions of the teeth, and this excellent expert orthodontist estimates the number of failures at not less than 80 per cent. This, then, fully confirms my statement, founded on facts, that the diagnosis is wrong at the outset, and that logically speaking a good result can be nothing but a matter of accident.

The successful cases are, then, in the first place, those belonging to the first class of Angle, and, further, the anomalies originating in causes that can be definitely pointed out. Since the above is not hypothesis, but actual fact, it is, in my opinion, high time to take this question into consideration.

During the past fifteen years a very great number of children have been tormented with apparatus that had to be worn for years and often caused great discomfort—so much so that in many cases it is doubtful whether or not the child's power of resistance has been taken into sufficient account in the treatment, especially when we consider that in those long-treated cases the results were not in proportion to the trouble taken, not to mention the great expense incurred. It therefore seems to me that the time has come for changing our method of treatment in the interests of our patients as well as those of the profession, which can scarcely have gained much by all those unsuccessful efforts.

If we return to the facts, we must ask ourselves, What shall be the method of procedure now that the method hitherto followed has proved to be ineffectual? Many adherents of the Angle school have stated that one of the great advantages of this system is that extraction is superfluous, thus rendering a fixed scheme of treatment possible as well as preventing injudicious extraction. This is undoubtedly quite correct, but it does not eliminate the fact that it is better to follow a more difficult method than an easy one that does not lead to results. The deduction, then, is simply this: That a person who does not feel quite competent in orthodontic matters will do better to leave the treatment of complicated tooth anomalies to more competent ones.

FUTURE METHOD OF PROCEDURE.

In treating tooth and jaw anomalies in the future we shall have to consider the fact that not a single individual is identical with any other, but a hybrid in himself; that, as such, he may show all possible anomalies, even as to correlation of his jaws. We must therefore never compel a face to take the form of a particular norm, but, on the contrary, change it as little as possible, and interfere only when deficient mastication or esthetic effects peremptorily demand it.

In many cases therefore, surgical treatment will be necessary, and one should not hesitate to perform a surgical operation in such a case. The purpose of this paper is not to present a new method for obtaining a correct diagnosis and therapy—which by the way I could not possibly indicate, but that it will have to be on another basis than the present one is quite sure. That this is not an impossibility Dr. van Loon has pointed out in his study on the normal and abnormal relations of the teeth to the facial lines.*

It goes without saying that in many cases the method suggested by Angle will prove to be the proper one; we should cease, however, blindly to follow a system which tends to force every individual into a fixed scheme of treatment and which must undoubtedly give rise to failure in many instances.

I wish to quote from an article by L. G. Singleton in the DENTAL COSMOS for January 1916, entitled "A Contribution to the Study of Faces": "If parents could be convinced that their children would be doomed to wear masks for the balance of their lives instead of their own faces, as the result of perversion of their dentition, they would become our enthusiastic patrons." This is undoubtedly true for the many cases in which neglect is the cause of the anomaly, but I should like to add the following remark: If parents could be convinced that their children would be doomed to wear masks for the balance of their lives instead of their own faces, as the result of long, injudicious treatment by the dentist, they would curse us from the bottom of their hearts.

Should I have contributed in any way to our escape from such a curse, the purpose of this paper will have been fully attained.

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* See DENTAL COSMOS for September 1915, vol. lvii, p. 973.

The Essential Principles of Practical Teaching.

By THOMAS GADDES, M.D.Denver, L.D.S.Eng.&Ed., Penrith, Eng.

(Read before Section X of the Sixth International Dental Congress, London, 1914.)

WHAT TO TEACH.

OF the subjects which enter into the curriculum of the dental student, the teaching of any one, and therefore of all, may be usefully divided into the study, first, of the sciences or fundamental principles, and secondly, of the application of those principles. In certain subjects, as in dental mechanics, otherwise called dental prosthesis, art also demands consideration.

DEFINITIONS IN THE THREE BRANCHES.

To convey a right and clear understanding of such a primary and threefold division of what to teach, it is first desirable to define the terms of each of those divisions. Furthermore, in this communication, also in common phraseology, the term "art" is frequently used; and it conveys ideas, thoughts, and purposes having different significance. For definiteness and clearness of conception the following divisions and definitions of knowledge may be useful.

Science treats of the forms in which phenomena are known to us, and of the phenomena themselves.*

Art is the employment of means to accomplish a desired end, as by the application of science (applied science) combined with skill or dexterity in adapting means to a functional end—which is mechanical art, or technique. The display of esthetic feelings, and of the concordant relations of those feelings, and not directly connected with a functional end, is *esthetic art*.

Each of these three branches of knowledge, presented in general terms, will now be briefly extended in explanatory form; and to illustrate that each branch must be dealt with in teaching, the subject of dental prosthesis can again be taken.

Pure science. The sciences directly embraced by dental prosthesis are physics, chemistry, and biology.

Physics deals with metals and alloys, non-metals and earths, mechanics, cohesion and adhesion; malleability, ductility, stress and strain; heat, light, electricity, gravity, weight, and so on.

Chemistry deals with chemical action and affinity; atoms and molecules; acids, bases and salts, and the composition of matter.

Biology includes the study of organic substances, such as beeswax, gums, and resins, and the living tissues and functions to which the various materials are eventually to be adapted.

It may be well to observe that these three sciences are not abstract, but, as dealt with in this connection, are concrete; and in the study of matter there comes a point where more than one science is involved. Hence such terms as chemico-physics and biological chemistry. "Every phenomenon [of existence] is more or less composite."* Iron, as an example, has the physical properties of specific gravity, specific heat, melting-point, ductility, etc., and also the chemical properties of atomic weight, valence, affinity, etc. So far, the subject-matter of teaching has been pure science.

Applied science. The application of

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* Abridged from "Classification of the Sciences"—Spencer.

* Spencer, *ibid.*

the knowledge—of causes, powers, laws of phenomena—gained as pure science to the execution of a piece of work, say a denture, when combined with dexterity or skill in adapting means to a functional end in view, constitutes the technique of that operation. In using a file or other cutting tool there is the application of kinetic energy, a form of dynamic force, to overcome the cohesion of the material and the friction of the instrument—applied science; also the skill or dexterity in giving certain movements and angles of application to the cutting instrument in order to produce satisfactory results. The skill or dexterity which is brought to bear in accomplishing that functional end is often designated "mechanical art," or is included in the "industrial arts." But the term "technique," with the definition and more precise limitation as here adopted, is not unworthy of consideration.

Esthetic art dictates the outlines and fulness of the plate, and "how much 'tis best to show," also the color, form, length, and arrangement of teeth. These manifestations of feeling and sentiment connote physical beauty rather than utility and practical needs. They, as modes of fine art, express the beautiful in form, color, rhythm, and harmony, and are, as already implied, distinct from practical needs, or the "industrial arts," and especially that part of culture known as manual dexterity.

REMARKS.

The foregoing illustrations of the three branches of knowledge which are brought to bear in executing the piece of work instanced do not exhaust the many forms in which each of those branches of knowledge relates to dental prosthesis generally. But they do exemplify the order, as distinguished from disorder, into which the varied actions fall according to the classification and the definitions of the phenomena which are hereinbefore presented. By arranging and classifying the details of the subject-matter of those groups of phenomena; by recognizing the individual and minor facts which, by aggregation, constitute the major or concrete group of facts; by recognizing the relations of the minor facts and conditions to each other, as well as the relations of the major (the greater groups of facts) to one another; by first giving the facts and then the generalizations from those facts: it is in knowledge being so arranged and classified that any approach to a scientific exposition of phenomena becomes possible. There must be a deliberate and scientific method of thought and action. In other words, any dissertation, or any attempt to teach or impart a knowledge of phenomena, either objective or subjective, which is not so arranged is unworthy of the term scientific. It is nescience. Common knowledge consists of unconnected and unrelated facts only; whereas science consists not only of experimental knowledge or facts but of facts organized on the basis of their connections and relations, and of laws the product of such organizations. The word "scientific" is in the air. It is in the mouth of the man in the street. It is a term loosely misapplied. Teachers, of all persons, should be strict in this as in other terminology.

As the foregoing general statements and observations, as to science and technique, apply to dental prosthesis they are equally relevant to all the subjects of the curriculum of the dental student.

HOW TO TEACH.

Having discovered what to teach—pure science, technique, art—the next question is, How to teach. The lecture, the demonstration, and the individual practice and execution of the demonstration, are the three methods.

THE LECTURE (PREAMBLE).

Teaching is a science and an art. The several and varied items of knowledge forming the "organism" of the curriculum can be studied structurally and functionally in their individual forms—*i.e.* of themselves. Furthermore, those items or subject-matters of knowledge may be viewed in their structural relations in the organism as a whole, and, also, in their functional relations in the organism as a whole. Such an analytical method or order of dealing with "the forms in which (those) phenomena are known to us" is in accord with the preliminary definition of science, and, therefore, it is strictly scientific. The exposition of that pure science is the function of the respective lecture. The teaching of theory, or the imposing of mere personal opinion, or any form of dogmatism (so often irrational), ought to be clearly differentiated from matter of demonstrable and experimental certainty—*i.e.* from matters of pure science. In other words, the lecture, where adopted, is preeminently the place to point out and consider the facts and fundamental principles of each phenomenon. As concrete examples of the application of these three methods, each means, respectively, may be briefly illustrated in the subject of dental prosthesis.

DENTAL PROSTHESIS.

The lecture would include consideration of the source, composition, and properties of the materials employed, *e.g.* impression materials, plaster, molding sands. In connection with impression materials there are, as phenomena to be considered, the factors germane and incident in obtaining an impression of the mouth, such as the plastic condition, the setting or hardening or contraction properties of the materials used; the conditions of the mouth; cohesion, adhesion and atmospheric pressure; also those and other factors in producing distortion of the impression. The principles of molding and casting. The considerations underlying the making of a plate for a denture include the condition of the mouth, its normal and abnormal features, the material suitable and not suitable for the several states of mouths. If a metal plate, its relative malleability and hardness. The shape best to withstand the stresses and strains, to retain it in position in the mouth, and to accord with the various physiological processes. A statement of some of the dynamic and static forces, forms of kinetic energy, brought into use in the several manipulations. The principles of the shapes of cutting tools—file, shears, chisels. "Every mechanical process and the form and theory of every tool are based on established principles of science."* If a rubber plate, the nature and properties of rubber and vulcanite, and the principles and theory of vulcanization. All this, and much more than this mere sketch, without overlapping and reiterating the details of the science subjects of physics, chemistry, and biology, but taking from them just so much as bears upon the special subject. In other words, the student having already received instruction in the general principles of physics and chemistry, the function of the special lecture is to point out where and in what manner those several science principles have to do with that particular subject, without necessarily explaining in detail the phenomena of, say, statics, dynamics, cohesion, adhesion, atmospheric pressure, chemical affinity, and other work which has previously been done in other classes. It is in that manner that the lecture lays the science foundations upon which the superstructure, technique, is to be built.

DEMONSTRATION.

The instructor in applied science or technique in performing or considering the various manipulations in the construction of a piece of work, say a wrought plate for a denture, would demonstrate in what manner the underlying principles of science, already discoursed upon in the lecture, are applied; and that their proper application forms the intelligent basis of each action. He would give the reason for each act, and for the sequence of each step in the progress of the work. With a metal plate, the line of the grain of the rolled metal in its relation to the contour of the plate and to stress and strain; the physical peculiarities of annealing the particular metal; how to "humor" or take advantage of its malleability; pickling and cleansing; how to use the mallet and hammer in applying dynamic force, and in producing a static force or equilibrium of stress in the metal. He could also, *inter alia,* point out that by not applying those principles, and being ignorant of the reason why and wherefore of the several actions, the best and intelligent results are either not attained or are attained empirically—by rule of thumb. In all the actions just now indicated there is the adapting of means to an end, and that end is a functional or working end or object in view. Here, again, the demonstrator in applying the science principles (which have already been pointed out by the lecturer, and the details of those principles have yet previously been expounded by the respective science teachers) is not called upon to reiterate or repeat the expositions of the lecturer. Nor is the lecturer, as such, to demonstrate the application of the sciences which it is his limited function to teach.

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* "Manual Training"—Woodward.

To the sphere of demonstration, that is, to the instructor in technique, falls the duty of showing the application of those esthetic feelings—esthetic art—some forms of which have already been mentioned, to which the particular work lends itself. The broad distinguishing feature or characteristic of this form of art is, as already pointed out in the preliminary definitions, that it is not directly connected with the functional end in view. Therein it contrasts or is differentiated from the skill or dexterity displayed in the technical manipulations (or so-called mechanical art) which, as previously mentioned, have a functional end in view.

PERSONAL ACTION.

The student having been taught by lecture and by demonstration, there now remains to be dealt with the third method of teaching, viz, individual practice. It is personal knowledge and action, first-hand facts and evidence, that compose personal experience. And when experience is gained in striving for and accomplishing an end in view, with each step directed by example, or by reason, and by knowledge of the incident causes and agents over which we have control, then we have that invaluable and superlative means of instruction, viz, individual practice—personal experience. Personal experiences contrasted with the written dictates or experiences of others, give the clearest concepts, and their vivid impressions on the mind of the student sink deeper into the "tablets of memory" and, by their associations as organized first-hand facts, are thus the more readily recalled to aid sound judgment, practical power, and efficiency. Facts ascertained at first hand are more instructive, more pleasurable, than communicated, second-hand facts. The truth that individual practice, especially under the conditions here set forth, is of the highest value as a means of "how to teach" is so self-evident that the subject need not be further elaborated.

A most valuable adjunct to the formal and inflexible lecture, and to the demonstration also, is the quiz—the oral examination of the assembled class. A portion of the time of each lecture period; or, during such period, at frequent intervals throughout the course; or, occasionally, the whole time of the class meeting, may be devoted to the quiz. Exercises of that kind are conducted under the normal and most favorable conditions of the student. They stimulate attention and industry. They inform the teacher himself—apart from any preparatory officer—if his seed has fallen on good ground, and, more especially, if he has sown his seed in a manner possible for it to bear fruit. The results of the quiz should be truly and justly recorded, and they, together with the results of a written class-examination, should form a report which ought to be considered at the pass examination—an expedient to be referred to presently.

MEDICINE.

There is the parent science of medicine and there are its branches, such as the practice of medicine, preventive or state medicine, surgery, dentistry. Just as the causation, signs, anatomical and pathological characters of disease are biologic and physical phenomena, so the dealing with those phenomena of disease, *inter alia,* forms the science of medicine. The practice of medicine embraces those sciences, and also the application of those sciences or technique. The technique of the practice of medicine would include certain physical and mechanical means and methods of diagnosis, prognosis, treatment and so forth. So too does the distinctive teaching of those several sciences and of their technique equally apply to other branches of the parent science of medicine, such as the "Art and Science of Surgery,"* or the "Science and Art of Surgery,"† the Science and Art of Dentistry. In like manner the biologic sub-sciences of anatomy, physiology, pathology, bacteriology, the "therapeutics of fact and the therapeutics of fancy,"‡ have their distinctive science principles, and also their respective technique. Two instances only may be presented.

ANATOMY.

Recalling the quotation from Herbert Spencer—"Every phenomenon (of existence) is more or less composite"—and the illustration of its application to iron, does not the study of anatomy, as a sub-science of biology, also necessitate a study or knowledge of physics and chemistry? Bones and the several hard tissues of teeth differ from one another in hardness, and the relative hardness is determined by the methods of the physicist, and by the aid of chemistry it is ascertained to what those differences are due. Again, the long bones are levers, and by the laws of mechanics (physics) they are classified into their respective groups. The form and structure of a muscle are related to its function (physiology). And when anatomy is studied from its physiological aspect there is a blending of those two sub-sciences, by which there is adduced the law that function begets structure. Such-like science principles of anatomy—facts and the relations of those facts—are within the scope of the lecture.

Demonstration of anatomy is well recognized as a function distinct from the lecture; and that practical (personal) anatomy by the student is likewise recognized as the culminating effort in learning that subject.

Esthetic art has, in medical anatomy, but little scope in ordinary; though the recognition and appreciation of facial outline, proportion and symmetry, as expressions of the beautiful, have their application.

OPERATIVE DENTISTRY.

The teaching of operative dentistry admits of similar treatment to that outlined for dental prosthesis. Under the science aspect there may be instanced, in connection with the operation of extraction, the various resistances of the tissues, the directness of the applied stress or force to overcome those resistances. Also, the principles of the shapes of cavities suitable for filling materials. The physical and chemical properties of filling materials. The physical and physio-pathological reasons for the contour to be given to approximal fillings. Upon such-like science principles, set forth in the lecture, the demonstrator and the student would work.

In demonstrating certain operations, esthetic art has a place and merits consideration. If "true art is to conceal art," the filling operation gives scope for that display of feeling.

RÉSUMÉ.

In dealing with the question "What to teach," the first place and importance was given to the general and natural sciences, and it was pointed out that a knowledge of those pure sciences forms the essential foundation, alike, for all the special subjects of the curriculum. As to "How to teach," the question as to whether the lecture is desirable, advantageous, efficient, or best, is not here discussed. But emphasis has been laid on the truth that, in dealing with the phenomena of matter and motion, there are ascertained and classified facts and laws relating to such phenomena. To point out and explain such of those phenomena as are incident to the subject taught is *the* way to lay the science foundation for the teaching which is to follow, be that either technique or art. Therefore, does not the question reasonably arise, Is not each subject of the curriculum of the dental student sufficiently complex and extensive to require a distinctive place and time for the imparting of the science foundations and relations of such subject? The principles must first be ascertained before they can be applied. The nature of the demonstration, as applied to several of the subjects of the curriculum, has also been instanced as exemplifying the distinctness of its function from that of teaching pure science. All that serves to make clear, to emphasize, to illustrate as practicable, what is especially advocated, viz, a distinctive place and time for imparting the pure science and, also, for demonstrating the applied science.

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* Charter of the Royal College of Surgeons of England, 1800.

† J. Eric Erichsen.

‡ T. Lauder Brunton.

The teaching of pure science need not, ought not, to be what Dr. Kirk* by implication regards as exclusively subjective, in contra-distinction to the laboratory system as objective. To awaken the apperception and many-sided interest, to attain the best educational results, the examination of phenomena (the teaching of science) must be by experiment and demonstration of phenomena. For instance, the bald (subjective) statement that the mechanical advantage gained by a lever corresponds with the relative distances of the weight, the fulcrum, and the power from each other, is of little educational value. But when the facts are shown and illustrated by experiment—made objective—very different interest is awakened. The function of the lecturer in dealing with that item of physics, aided by example and illustration, is definite.

The application of the knowledge thus gained to the action of a muscle on a bone; to the reduction of a sub-glenoid dislocation of the humerus; to the operation of tooth extraction; to a cantilever piece of bridge work; or to the use of a screw-key, does not call for a repetition of the physical science experiments; presumably, they have already been done in the physics department. The application of the principles of the phenomena in these several adaptations to a functional end is distinct from the exposition of the facts and reality of the phenomena themselves.

That division of the work of teaching (though, of course elastic, instead of being "purely an arbitrary division"), with that definiteness and distinctive limitation thus and in several other instances shown to be possible, does appeal as one suitable "for the practical education of the student."* The foregoing differentiation may, in no little measure, help toward a solution of the embarrassment expressed by Dr. Kirk when he aptly states that "Difficulty arises from our lack of a specific definition of the meaning of didactic instruction in contradistinction to laboratory or technique instruction."†

In this orderly method of how to teach—by the lecture and the demonstration, each having a distinctive function—there ought not to be, as previously mentioned, incidentally, any reiteration or repetition; neither should there, needlessly, be overlapping of the subject-matter of one lecture course with that of another. There should be kept in view the place which each part occupies in the whole. The lecture, the demonstration, and individual practice are already, in many instances, adopted; and in some schools, while they obtain in certain subjects, they are not methodically practiced in other matters, which are particularly suitable, especially for the demonstration and individual practice.

Reverting, for the purpose of emphasis, to the distinction between common knowledge and scientific knowledge, the facts of phenomena where arranged, connected, and compounded as a unified mass of facts, form the fitted blocks which construct information, and from which ideas are formed and true knowledge is built up. Some critic, possibly, may object to the distinctive, precise, and somewhat pruned limitation of the lecture as herein set forth, as departing too much from tradition and usage. To such a one the autobiographical words of Professor Huxley may perhaps furnish some matter for thought and reflection: "The only instruction from which I ever obtained the proper effect of education was that which I received from Mr. Wharton Jones, who was (1845) the lecturer on physiology at the Charing Cross School of Medicine. The extent and precision of his knowledge impressed me greatly, and the severe exactness of his method of lecturing was quite to my taste. I do not know that I have ever felt so much respect for anybody as a teacher before or since."

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* Report of the President of the Commission on Education of the F. D. I. for 1912.

* Dr. Kirk, *ibid.*

† The word "didactic" as here used is synonymous with the lecture method of teaching.

TEACHERS, EXAMINERS, AND EXAMINATIONS.

TEACHERS.

The scientific method—the scientific attitude of mind, of order and procedure—is, without equivocation, the first and penultimate essential in the application of the science of education. The more the scientific method, with all that it means, is the guiding principle which the teacher of science adopts in leading and directing the student—bearing in mind the principle of the connections of ideas, and pointing out the relations of facts as well as the facts themselves, so that apperception and many-sided intellectual interest may be aroused and stimulated, memory and real knowledge cultivated—the more does the teacher become worth the name of a science teacher of science. Awaken the interest, and that a many-sided interest; let the discourse be lucid, definite, methodical, and withal sympathetic, and less will be heard of distaste for this or that subject; of science, pure and applied, being dry as bones; of imperfect knowledge the fruitless result of teaching; of "the mentally starved soul prevented from desiring the very food that will save it." In that way dental education may possess something beyond a merely examination value; it may be given a many-sided practical value, just as it may be given a many-sided interest—the former (practical) being a sequential correlative of the latter. A teacher thus imbued with the scientific method and spirit and the faculty of teaching, has an immense influence in stimulating the attention, industry, and investigations of his pupils; and their happy and ever-living grateful memory of him as an inspiring guide, so well expressed by Huxley, verily forms a treasure in heaven.

Pedagogics. The proceedings of the F.D.I. bear witness to the necessity, expressed by representatives from different countries, of teaching men how to teach. Dr. Sauvez, in his pregnant address to the F.D.I. in 1908,* pertinently asserts: "We cannot forget that the curriculum may be magnificent and the teaching almost *nil.* The goblet may be full, but the inexpert hand of an incompetent master may empty it without profit." That a teacher shall be fit to teach is the first essential principle of practical teaching.

In the teaching profession teachers are trained how to teach. Pedagogics is not entirely left to auto-culture. In addition to training colleges several universities and institutions, in this country at least, have professorships and lectureships in pedagogics, or the principles and methods—the science and art—of teaching. Is it not possible to take advantage of these existing means, or to organize postgraduate courses in pedagogics? We have the practiced instructors, and distinguished men are to be found who undoubtedly would undertake such postgraduate work. In appointing candidates to the lectureships in several subjects of the curriculum, cannot preference be given, other things being equal, to those applicants who can produce evidence of having had such special training?

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* *British Dental Journal,* Nov. 2, 1908.

May not this Congress relegate to the F.D.I. — its standing committee — that aspect of the science and art of teaching as applied to the subjects of the dental curriculum, viz, teaching the teachers how to teach? The eclectic preparation of suitable literature seems to be the first step. The possession of a literature at once removes a subject from the region of fallible tradition and gives it a possible—indeed, the essential, the only—science foundation. The science of teaching embraces, as already stated, several sciences; and the art—the technique—of teaching permits of a large and varied scope for individuality. So, then, an available literature dealing with the sciences which are mainly biologic and psychologic, and with the means and methods of applied art—technique—is the first essential principle of this question. To the auto-cultured teacher (and, eugenically, to the embryo, to the fetal, and to the fully-fledged teacher) such a literature, emanating from that international source, would be of very great benefit; and, by reaction, of a wider benefit to teaching, to the profession, and to the public. That first step in the solution of this problem having been accomplished, the way will be prepared for further progress.

"Necessity is the mother of invention." In this matter necessity exists, and to meet it a practical suggestion is here put forth.

EXAMINERS.

The imparting of knowledge and the testing inquiry into the knowledge possessed by a student are mental functions closely correlated. The success of a teacher may be, apparently, depreciated by an unskilful examiner. Just as there may be unfitness of the teacher, so, as a corollary, there may be unfitness of the examiner.

The teaching of how to teach the subjects of the curriculum being entirely, or almost entirely, neglected—left, as presently to be mentioned, to auto-culture—so is the appointing of examiners not always all that could be desired. Hence has arisen the question, Who examines the examiners? Teaching, with a successful tutorial experience, may be regarded as the best training for an examiner. Yet an auto-cultured teacher, though often most capable both as a teacher and as an ascertainer of the knowledge and ability of a candidate, is occasionally found as lamentably incapable of imparting knowledge as he is of patiently, considerately, and with psychological acumen finding out the required intelligence of a student or candidate. This attitude or incapability in a non-examined examiner is not a little responsible for the disrepute in which examinations are frequently held. High academic distinction, *per se,* is not—ought not to be—the criterion or passport either to a chair or to an examinership.

Just as there is science and art in teaching, so is there science and art in examining. The science in each case consists, at least, in dealing with the mental and intellectual phenomena of the students. And those capacities are as varied as are their finger-prints. Hence the desired psychological acumen already mentioned. Unfortunately, there still exist, as Gerrish states, "examiners who may not have emancipated themselves from the trammels of tradition."* Again, what Spencer wrote in 1873 is occasionally felt to be pertinent today: "Examiners, instead of setting questions fit for students, set questions which make manifest their own extensive learning . . . they seize the occasion for displaying their erudition, regardless of the interests of those they examine."† Furthermore, just as a teacher or an examiner may be brim-full of knowledge and be unable either to impart it or to properly fish out knowledge from another, so, be it ever remembered, may a student, embarrassed by the excitement and circumstances of examination, be not more able to give out to such an examiner the knowledge which he really possesses. A flank movement will probably succeed when a frontal attack means failure; and, as a parallel, a synthetic inquiry will probably elicit satisfactory knowledge, when a stubborn persistence with a full concrete question leads from bad to worse. A bad general may cause the best soldiers to lose a battle, and a bad examiner may cause a good student to fail.

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* "Text-book of Anatomy."

† "The Study of Sociology," by Herbert Spencer.

EXAMINATIONS.

It should not rest with any one examiner to judge nor, especially, to reject a candidate. A scrutator or moderator, or at least two persons of equal authority, should, either jointly or separately, assess in each subject. It is at this juncture that the opinion of the teacher would and ought to be of some value. If the teacher has periodically inquired into and ascertained the progress of his students, and kept a true and just record of his quizzes, that measure of the student's intelligence (ascertained under the conditions already mentioned) ought in fairness to be now considered, particularly before an adverse judgment is concluded. An opinion based on such a record, taken and supplied by the teacher of each of the respective subjects of examination, would have its influence upon the teacher and his teaching, upon the examiner or examiners, and upon the student-candidate. The issue is important. The status and welfare of the candidate, of the teacher, and of the school are concerned in the results of the examination.

Forty years ago dental science was not as advanced as it is today, nor was the practical teaching equal to that of the present time. Notwithstanding this progress, we have not yet eliminated the unfit as teacher and as examiner. Perhaps that desideratum will only be accomplished when the study of eugenics has been further elaborated. However, there is the fact. Its removal is worth striving for, and to accomplish it would be a blessing.

Another need may be briefly referred to—viz, the desirability of ascertaining, as by examination, the knowledge of the student in each and all of the subjects required to be taught. Where that does not obtain, the curriculum has an appearance of virtue it does not possess, merely standing for a symbol of knowledge which the negligent student, and at the same time successful examinee, does not possess. It often leads to indifference and even contempt for the acquisition of that particular knowledge; and to such a student it undermines discipline and is demoralizing. Where there exist uncommendable regulations of that kind and a concomitant disregard of the weakness of human nature, there prevails the upholding of a system grievously at fault.

A teacher incapable of teaching; an examiner unfitted for his office; and the examination not embracing all the subjects taught—these existing imperfections in an educational system are disadvantageous to the student, to the practitioner, to the profession, and to the public whom the profession serves.

APOLOGY.

Having advanced, and just now reiterated, the underlying principles upon which must rest any scientific scheme of teaching the subjects of the dental curriculum; having relegated to each of the three methods of teaching the respective function of each method; having descanted on Teachers, Examiners, and Examinations; the writer has been cognizant of the circumstance that among his auditors are able and distinguished teachers, whose special indulgence is humbly asked for. There are, possibly, others of less experience, and perhaps less gifted; and, furthermore, there may be the teachers yet fetal and even embryonic who have to be taught how to teach. In our profession the teaching of how to teach (pedagogics) is almost entirely left to auto-culture. And if as a class-student the teacher of the future has, unfortunately, had to experience a common knowledge rather than a strictly scientific method of having his instruction imparted, such a one may find in this communication some grains of thought for future guidance and appreciation.

RECAPITULATION.

The essential principles set forth and the suggestions made in this report embrace—

(1) The differentiation of the subject-matter as science, technique, and esthetic art.

(2) The scientific method of exposition.

(3) Order, classification, and relation of facts.

(4) The subject-matter of the lecture to be confined to pure science.

(5) Theory and dogma to be distinctly differentiated from science.

(6) First lay the science foundations upon which the superstructure is to be built.

(7) The pruned—now pure science—lecture gives more time for technique, instruction, and practice.

(8) Personal action the superlative method.

(9) A definite place and time for these three distinctive methods.

(10) The class quiz to be universal.

(11) This definite division and distinctive limitation of the work of teaching is suitable for the practical education of the student.

(12) Teachers to cultivate the scientific method (and all that it implies), psychological acumen, and zeal.

(13) Education to have a many-sided practical value, not merely an examination value.

(14) Teachers to be taught how to teach.

(15) Postgraduate courses to be established for that purpose.

(16) A certificate in pedagogics (the science and art of teaching) to be required from teachers.

(17) The best training for an examiner.

(18) More than one examiner to adjudicate on a candidate's fitness.

(19) The records of the quiz to be considered at the pass examination.

(20) Examination to embrace every subject taught.

CORRESPONDENCE

The Naval Dental Service as a Career.

To the Editor of the Dental Cosmos:

Sir,—When we think of a career, in general, we mean that which we accomplish in life, or set out to do if we are young and life is ahead of us. No one can foresee what fate has in store for him, but, for the majority, each has a plan in life which he wishes to realize. Some have no plan, but would like to have one all laid out and with the magic word "success" written after every line.

What, then, does the average man mean by success? Many will say immediately, "Money." Very well, granted we all agree on that, though many of us are contented with a moderate amount.

What else? *A healthful occupation.* Our thesis concerns dentistry, therefore we do not need to winnow out all the professions to find a healthful one; we have already chosen it! Not only as to our own personal health; we are concerned with that of the whole community—wherefore we are in a sense philanthropists, for we link our lives with the alleviation of pain and the preparation of the rest of mankind for normal, healthy living. Is not that alone a high ideal for a career?

What else conduces to happiness in the choice of a career? *Congenial surroundings.* Is the working for hours every day far down in the light-well of a modern office building—is that to have congenial surroundings? We submit that it is not.

Further than these items, what more could a dental surgeon ask? *Practice.* That is the key to the situation. What does a wonderful skill avail us if we have no one on whom to demonstrate our dexterity? We desire as a *sine qua non* a large number of high-grade patients with every conceivable ailment, in order that we may try out our hard-learned theories. Professor X., the famous surgeon, said that under certain circumstances to save life we must inject solution A. Was he right? If we never see a case such as described by him, we never have more than an academic knowledge.

Many a man has a desire to see what the other man has; in short, he has the "wanderlust." Dentistry and travel are far from running mates. If we are away when the patient arrives we lose him irrecoverably. He goes to our rival and we neither see him nor get his fee. Our insignia should be a length of chain, indicating our bondage to our offices!

The United States Navy is an organization of perhaps 100,000 men, who are the "pick" of the nation physically, for out of every six applicants for entrance to the service five are rejected. Their officers are the cream intellectually of the preparatory schools of America. They are educated at what is generally conceded to be the foremost technical school in the world. It is therefore a high honor to be an officer of the navy. The officers of the "line," or fighting men, are mostly graduates of the Naval Academy at Annapolis. The staff officers are mostly taken from civil life, and are chosen by competitive examinations from applicants who have made excellent records in college. They must be sound physically, of good moral character, recommended by prominent people who live in their vicinity. The "staff corps" are the medical men, the dental men, paymasters, chaplains, and the new line officers who perform engineering duty only.

The navy provides ready-made a life plan for the dentist. For a certain number of years he is a lieutenant, junior grade; then he becomes full lieutenant, and consecutively lieutenant-commander, commander, captain, and rear-admiral. All is ordered in his life. His salary is fixed by law, and as he is promoted his salary rises, his house is enlarged, or a cash equivalent given if no house is available. The house is furnished well, and heated and lighted without charge. The salary is commensurate with the services rendered and increases by 10 per cent. every five years until a 40 per cent. increase is attained, as well as the regular increase from rank to rank. It is equal to that of his classmates who are in civil life.

A life on the sea is well known to be healthful; in fact, it is the common complaint of our congressmen that the retired list of naval officers is too full of rear-admirals—they live too long for economy in appropriations. In the navy one gets fresh air and plenty of it, and does not have to inhale street and other dust unless he goes ashore. Often we go to sea for protracted periods, and for weeks, even months, do not set foot on the land, and sickness is almost unknown unless it be contracted ashore.

Now for our ideals. We prepare the naval *personnel* for the highly important duty of eating. When a man can eat, and does it, he is fit for fighting, which is our other function, and one not to be glossed over, for all our endeavors are for preparedness in national defense or offense. The navy is primarily the strong right arm of America, and is used to uphold the right and succor the distressed. When the man at home says, "Let us fight," he means "Let the navy fight"—and it becomes our duty to do so. Therefore, first of all we are a patriotic body of men, and must be citizens of the United States.

Congenial surroundings are provided as far as their physical aspect can be by money. In truth the ultimate source of happiness in the navy lies not in the fact that we live in floating palaces or in bamboo huts in Nicaragua (which we do not), but in that we are at peace with ourselves and our fellow men. The more material aspects have much to do with our well-being. Large, light, airy offices are provided ashore with every convenience for doing ideally perfect work. An assistant is usually provided who performs the functions of the office assistant in civil life. Plenty of material of the highest quality is furnished, and the procedure is not governed by the cost. In the neighboring Naval Hospital is an excellent X-ray apparatus available for use in confirming diagnoses. Aboard ship, room and natural light are at a great premium, so that the office must be more modest in size, but it is at least large enough to work in. The lighting of the office is either natural or artificial; if the latter, there is all that is needed.

We mentioned "practice" as necessary to success in dentistry;—no one in the navy will ever want practice. By the time your office equipment is installed you will have a waiting list of from 100 to 150 patients anxious for your services. On a large ship (the only kind a dentist is put upon) there are on an average 900 men having 30 teeth each, or 27,000 teeth which it is your duty to care for and keep in order. New men are constantly coming and older ones being discharged, so that there will never be any lack of human material. You become an extraction specialist, for in a year you may do more of that than your professional brother ashore who does nothing else. Then there is a large proportion of first-aid cases. Plenty of operative work is at hand, and the more you do the more you are called upon to do. Now and then a rare case of Ludwig's angina will present itself, and occasionally fractures due to falls in the dry-dock, down a ladder, in "coaling ship," or most often in boxing, plain or gloved.

Anyone with the "wanderlust" can be satisfied in the navy. The ships that I have been on in a two-year cruise have steamed no less than forty-odd thousand miles in that time, including three trips to Honolulu, seven to Mexico, and the present one to Nicaragua. The office, the patient, and the dentist travel together.

In the near future, examinations will be held to fill fifty or sixty original vacancies in the Naval Dental Corps. Those who wish more specific data concerning requirements for entrance to the corps, promotions, salaries, etc., should address the Surgeon-general, Navy Department, Washington, D. C.

J. D. Halleck, B.S., D.D.S.,
Assist. Dental Surgeon, U. S. Navy.
U. S. S. "San Diego."

[*Note.*—The new law concerning the Naval Dental Corps is printed elsewhere in the present issue.—Ed. Dental Cosmos.]

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Susquehanna Dental Association of Pennsylvania.

Fifty-third Annual Meeting, held at Scranton, Pa., May 16, 17, and 18, 1916.

THE fifty-third annual meeting of the Susquehanna Dental Association was held in Scranton, Pa., Tuesday, Wednesday, and Thursday, May 16, 17, and 18, 1916.

The meeting was called to order Tuesday morning, May 16th, at 10 o'clock, by the president, Dr. E. J. Donnegan, Scranton.

Dr. J. P. COULT, Scranton, invoked divine blessings on the deliberations of the association.

Dr. R. M. STRATTON, Scranton, welcomed the association to the city on behalf of the dentists of Scranton. Dr. J. C. Hertz, Easton, responded to the address of welcome.

Vice-president Dr. D. S. Gardner, Scranton, occupied the chair while the president, Dr. E. J. DONNNEGAN, read the President's Address.

Dr. Gardner appointed the following Committee to consider and report on the President's Address at a later session—Dr. C. S. Van Horn, Dr. J. C. Hertz, and Dr. C. C. Laubach.

Motion was then made and carried that the meeting adjourn until the afternoon session.

TUESDAY—*Afternoon Session.*

The meeting was called to order Tuesday afternoon at 2.30 by the president, Dr. Donnegan.

The President announced as temporary members of the Board of Censors Dr. Stratton and Dr. Bachman, to take the place of the two absent members.

The President then introduced Dr. R. H. IVY, Milwaukee, Wis., who read a paper entitled "Co-operative Organization in Dental and Oral Surgical Practice, Especially in the Diagnosis and Elimination of Chronic Mouth Infection as a Factor in Systemic Disease."

[This paper is printed in full at page 15 of the present issue of the COSMOS.]

DISCUSSION.

Dr. W. Stirling Hewitt, Philadelphia. Dr. Ivy's paper covers the technique of the location of septic foci as thoroughly as it could be done. I was glad to note that he emphasized the necessity of system in practice and a definite series of examinations for each patient, as there are so many apparently unrelated conditions which when correlated are very significant. I wish to indorse his statements concerning the radiograph, and especially concerning the futility of attempting to make a diagnosis upon it alone. The radiograph, indeed, is as important as the physical examination.

I was particularly interested in the group method of examination and treatment, and at present it looks as if this were the only solution of the problem. It does seem, however, as though it would take all the personal touch out of practice and tend to introduce machine-like efficiency.

For my part I do not think that I should enjoy practicing as a cog in a machine—and when I cease to enjoy my work I will try something else. It does seem that one man should be able to cover the entire mouth, and I believe it could be done if we only rearranged our ideals and methods of education. The general practitioner should be the expert in prophylaxis, orthodontia, preventive work, radiography, and in general pathology in its relation to the oral cavity. This should be the routine work of the general practitioner. If we must have specialists let them be the prosthetic and operative experts. We should then have the general oral pathologist as compared in his work to the general practitioner in medicine and the mechanical work done by the dental equivalent of the surgeon. Every dentist would then have a good foundation in pathology, and such a man would be able to take care of practically all conditions of the mouth.

Dr. Ivy's method has one great advantage, in that it can be carried into effect at once, whereas it will require years to educate the dentist and public to any radical change. After all, efficiency is the important thing, and Dr. Ivy has certainly shown how this may be attained.

Dr. Fred D. Miller, Altoona. It has been a great pleasure to me to have read and heard Dr. Ivy's paper. The subject of co-operative organization in dental and oral surgical practice is certainly most timely and interesting, as this is surely an age of specialization. Dentistry today involves entirely too much for one man to grasp, not to speak of practicing all the different phases efficiently. That specialization has certain disadvantages to both the patient and practitioner there is no doubt, but these disadvantages will be overcome in the process of evolution. We are yet primitive, and all that has gone before is a preparation for the better things that are coming. Dentistry is going forward today by leaps and bounds, and it is a "man's job" to keep up with the procession.

I once heard a story of a young barber who, upon deciding to study dentistry, told his father about it, and his father replied that he thought it was a good idea. He said, "You know how to operate the chair; the rest ought to come easy." There are still a great many uninformed people whose ideas of what a dentist must know are very vague, and one of the most important functions of the dental societies of today should be the education of the general public.

The unfortunate feature of dentistry today is the time necessary for the performance of the various operations, and that, I believe, will always be a handicap in rendering the best service to poor patients. Brother Bill says, "Good dentistry cannot be done for poor people." The dentistry of tomorrow, therefore, will consist more than ever in exodontia and prosthodontia, sacrificing masticating efficiency to avoid systemic infection.

In regard to a closer co-operation with the medical profession, let me drop a word of warning. For years dentists have been seeking that closer relationship, and just when we are attaining it, we learn that in all probability we have been causing a great many of the conditions which we have accused the medical profession of neglecting; so that unless we develop our root technique to such a degree of efficiency that we shall be able to successfully treat pulpless teeth and eliminate or prevent periapical infection, we must have the courage to practice wholesale extraction.

It has been my good fortune to be

closely associated with a radiologist, a surgeon, and an eye-ear-nose-and-throat specialist, and we have co-operated in a great many cases, although we are not under one roof. I can see the great advantage of such a plan, although we dentists in the smaller communities are handicapped to a far greater extent than are the specialists in the larger cities, in that we are compelled to conduct a general practice.

In the past three years I have had a great number of radiographs taken, and I wish to impress upon every conscientious practitioner the fact that the X-ray is an absolutely indispensable adjunct to the modern dental office. The intelligent interpretation of dental radiographs can only come with experience, and the X-ray is of no value unless the subsequent treatment is intelligently conducted.

Our local radiographer has frequently cited cases to me where he had taken radiographs for dentists who did not know why they wanted them or what to do after they got them. "Many dentists," he said, "seem to think that simply having a radiograph taken cures the condition." This is a deplorable state of affairs, and emphasizes the desirability of the adoption of a standard method of treatment for periapical infections and pulpless teeth.

In regard to the various specialties into which dentistry may be divided, we can specialize in exodontia, prosthodontia, orthodontia, root-canal work, etc., but one cannot specialize in the treatment of pyorrhea, because to successfully treat pyorrhea it is necessary to perform all the different classes of work, *i.e.* restoration of contact points, root-canal work, restoring missing teeth, as well as the surgical procedures necessary. Thus we cannot have a purely pyorrhea specialist outside of an organization such as the essayist has advocated.

There are only a few points in which I differ with the essayist. He says, "At this time also may be done resections on apically diseased teeth showing good root-fillings." Personally, I should not care to rely solely on a radiograph as indicating a good root-filling, as it is very easy to mistake a faulty root-filling for a good one in a radiograph. A root-filling may seem to go to the end or even through the end of the root, and yet may still not be a good root-filling unless all of the organic contents of the canal have been removed and the canal homogeneously filled through the end and sealed from its periapical aspect.

I heartily agree with the essayist in his effort to observe the strictest asepsis in root-canal work, and that in this way an important source of periapical infection may be avoided. However, I do not agree with him that this feature is of greater importance in preventing infection than the complete filling of the root-canal.

The technique of proper root-canal therapy is a chain composed of three important links, three essential points which, according to Rhein, are as follows: (1) "The removal of every particle of pulp tissue," (2) "the extirpation of every pathogenic condition," and (3) "the hermetic sealing of the canal so that reinfection is impossible." The completed root-filling will not be a success unless these three steps are carried out, even if every aseptic precaution has been taken.

I believe the essayist will agree that in surgery there are many operations which are failures, although they may have been performed aseptically; the operator may not have followed a good technique.

In his closing discussion I should like to have the essayist tell us what method other than apicoectomy he uses in the obliteration of periapical infection.

Dr. J. G. Lane, Philadelphia. Naturally, I thoroughly agree with Dr. Ivy in his idea of specialists and specialization, and by that I mean the extreme limit of specialization. As has been said in the discussion this afternoon, it would be fine if every one could be sufficiently qualified and proficient in all branches of dentistry, in everything that we pretend to do, to deliver the maximum limit of service, but where is the man who could do it? There is not time enough in the years we have to practice to become proficient in all branches of our work, and the man who attempts it simply becomes a jack-of-all-trades and master of none. One of the discussers spoke of not wanting to be a cog in a machine. I believe it is better to be a well-fashioned efficient cog in a nice piece of machinery, as a means to an end, than to be a wheelbarrow. Dr. Ivy has shown us a system in which each and every man is a specialist in one particular line, and what one man might see and possibly regard as being superficial would be by another viewed from an entirely different standpoint, and an entirely different meaning attributed to it. No one man can look from all viewpoints and see all these things in their true light. It is true that specialism in its extreme sense may tend to make the specialist become narrow; yet this need not be. However, if a man can do only one thing and do it well, he accomplishes more than if he tries to do all things and fails in all. Dr. Ivy also advocates a definite technique. I am a strong advocate for technique to the extreme limit. If anything will get results it is the plan of following a definite technique. We are fortunate in having Dr. Ivy come here and tell us how to arrange a complete power plant, into which we can turn the raw product and produce the finished result.

Dr. H. S. Seip, Allentown. I am sorry that I did not have the time to prepare a discussion on this valuable paper, but I do want to thank Dr. Ivy for bringing to us a perfected system which will eliminate any occasion for the oft-used excuse that we have done the best we could. Dr. Grieves some time ago very forcibly impressed upon us our responsibility when he asked: "What are you going to do, gentlemen, if you are brought to the bedside of a dying patient, where the internist flashes before you an X-ray film and says that surgically everything has been done that is possible, and then shows you the cause of the trouble in a tooth?" You see what a grave responsibility is placed on the shoulders of dentists. I feel that this condition is being used to some extent by the medical profession as an excuse, in some instances where they have reached the limit of their abilities, to throw the responsibility on to the shoulders of the dentist, and I believe there are many cases of systemic troubles attributed to faulty dentistry for which we are not responsible. However, Dr. Ivy has shown us a system by means of which we can protect ourselves and our patients, which after all is the important thing.

Dr. H. M. Beck, Wilkes-Barre. There can be no question about the benefits to be derived from specialization in dentistry. No dentist can become proficient in all the branches of dentistry as it is practiced today, as the subject is too large and life is too short to acquire proficiency in all branches.

It has been my dream for years to some day have the proper kind of place in which to practice dentistry, and the proper kind of men associated with me. I am sure the result would be most gratifying to my associates, my *clientèle,* and myself. In our city the medical men are only too willing to co-operate with us, and we are also fortunate in having the co-operation of an expert pathologist and bacteriologist, and some of the results worked out by this combination of dentistry and medicine are most gratifying.

I quite agree with Dr. Ivy that the X-ray machine is an absolutely necessary part of our equipment, and that we cannot practice modern dentistry without the aid of the X-ray. Dr. Ivy places special emphasis upon the fact that he does not depend upon one radiograph alone in making his diagnosis, but always verifies the first picture with several others taken from different angles. This method of diagnosis appeals to me as being scientific, correct, high-grade dentistry.

Dr. Ivy's comments on root-canal fillings are timely and to the point. Undoubtedly, in the past, before the advent of the X-ray machine, our work in root-canals has been defective and the cause of much after-trouble. For several years we have been using Dr. Rhein's method and the results have been most gratifying. Unfortunately this method requires much time and careful technique, and consequently is so expensive that all of our patients cannot have its advantage.

Dr. Dudley Guilford, Philadelphia. I wish to say, Mr. President, that I consider this a remarkable paper which Dr. Ivy has given us. Undoubtedly we will have to adopt some plan such as the essayist has outlined and I think before long we will have numerous centers of experts under one roof to do this special and most important work. It does not mean, of course, that every man in general practice should begin to do this special diagnostic work; that would be absurd—just as absurd as it would be for every physician to attempt to have an establishment like the Mayos in Rochester. It necessitates the bringing together of a number of men who are capable of working harmoniously, and that is what Dr. Ivy brought out—the necessity in this work of the affiliation of men familiar with their subjects and working together with as perfect a system as possible.

Dr. Ivy (closing the discussion). I wish to thank the speakers for the interesting discussion. Dr. Lane answered the point of the cog in the wheel very well. In regard to asepsis in filling root-canals, I have not overestimated its importance. What I meant was that if there was any question as between the two, *i.e.* complete mechanical filling or observance of absolute asepsis with possibly incomplete filling, I would consider asepsis to be by far the more important factor in preventing future disease. It is impossible in all roots to get rid of all the organic material; it is impossible in all roots to reach the end of the canal, and fill all the little canals at the end. There is a regular delta sometimes, with five or six radiating canals at the apex—not a *single* apical foramen, but multiple foramina—and it is practically impossible to fill all of these. If these can be sterilized and asepsis observed in working on the canal, I believe the operator has done all that is possible toward preventing disease. Then, again, we find by means of the radiograph so many teeth that have been filled perfectly to the end, as Dr. Miller said, yet which still have an area of infection about the apex.

In apical resection where the root has not been completely filled but where the filling approaches reasonably near the end, we must be sure that the resection is made far enough up to insure that the canal of the remaining portion is left completely filled. In these cases I very frequently cauterize the stump with silver nitrate, by which means I think we can seal up fine canals that do not happen to be filled.

One of the discussers spoke of other methods than resection in treating periapical disease, *e.g.* ionization. I do not believe it is wise to temporize with these slower methods where the patient is suffering from systemic trouble. We have not been using ionization long enough to present results with regard to bone-growth after this form of treatment, but Dr. Rhein has shown that the rarefied areas may become filled-in with new bone.

With regard to vital abutments for crown and bridge work, I personally have nothing to do with the prosthetic part of the work. But investigation with the X-ray of crowned teeth that apparently had been put on vital abutments, and comparison with teeth that had been devitalized, revealed the fact that the teeth which had been devitalized and had been filled with various root-filling materials showed thirty-three per cent. of periapical rarefaction. In teeth used as abutments that had been originally vital, showing no root-filling, we found only from six to ten per cent. with periapical disease. This is one point in favor of using vital abutments. We believe practically, however, that in most cases devitalization for abutments is quite safe provided strict asepsis is observed and the proper mechanical principles are understood.

The session then adjourned until 8 P.M.

TUESDAY—*Evening Session.*

At the Tuesday evening session Dr. H. S. DUNNING, New York, gave an informal lecture on "Local Anesthesia by the Fischer Method," and showed a moving picture film illustrating Dr. Fischer's original method of using novocain for conductive anesthesia, etc.

Dr. DUDLEY GUILFORD, Philadelphia, gave an informal talk on "The Work that the American Dentists are Doing in France for the Men Wounded in the Mouth and Jaws."

WEDNESDAY—*Afternoon Session.*

The meeting was called to order Wednesday afternoon, at 2.30 o'clock, by the president, Dr. Donnegan.

Dr. Donnegan introduced as the first speaker of the afternoon Dr. W. STIRLING HEWITT, Philadelphia, Pa., who read a paper entitled "Toxic Substances Which May Cause Systemic Disturbances, and Which are Formed in the Absence of Specific Infection or Pus."

[This paper is printed in full at page 43 of the present issue of the COSMOS.]

DISCUSSION.

Dr. R. H. Ivy, Milwaukee, Wis. Dr. Hewitt's paper shows a great deal of careful study, and has given us something to think about. To grasp the subject fully will require careful reading both of the paper itself and of the references quoted. As far as I am aware Dr. Hewitt has gone a step farther than anyone has hitherto done, in calling attention to the possibility of chemical substances other than bacteria and their products being formed by pathological conditions in the mouth, and their absorption causing systemic symptoms. He has also given us an inkling as to what some of these products might be. The actual causes of the severe constitutional symptoms sometimes observed in abnormal mouth conditions, such as pathological dentition in children and difficult eruption of the third molar, are often obscure, and have been hitherto chiefly explained as the result of mechanical pressure on the sensory nerves bringing about various reflex nervous phenomena. Whether, as Dr. Hewitt suggests, these symptoms are due to the absorption of poisonous substances produced by metabolic changes in the tissue cells apart from bacterial action, can only be decided definitely by further observation and experiment. At present the subject is purely speculative in character, and enters a field in which very few of us are competent to work. But if such men as Dr. Hewitt can suggest or give a clue to the physiological chemists and pathologists upon which to work, some definite scientific data should soon be forthcoming on this problem. At the present time there is still so much skepticism among medical and dental practitioners over what are regarded as demonstrated facts by laboratory workers, in the matter of mouth infection in its relation to systemic disease, that until these are brought home to the majority we should do well to proceed a little slowly in speculating upon new problems of which the scientific basis is at present so obscure.

In many of the mouth conditions mentioned, the symptoms which Dr. Hewitt suggests are due to the absorption of chemical organic poisons produced as the result of local faulty metabolism which I believe can be adequately accounted for by already well-recognized phenomena. Thus, mechanical irritation of the gums is always followed by infection, with the consequent production of toxins which are the result of bacterial activity.

It is questionable whether putrefaction and decomposition of dead organic material in the mouth are anything more than the result of the action of saprophytic bacteria, and thus ptomains, muscarin, etc., may be produced. To take a familiar example, in the uterus after miscarriage the blood-clot is frequently retained, undergoes decomposition by saprophytic bacteria, and so-called ptomains are formed, and being absorbed by the circulation, cause septicemia. In this example, and in other cases, I should consider that if bacteria were kept away, there would be very little formation of these poisonous substances.

I believe, however, that much still remains to be cleared-up in our knowledge of pathological conditions in the mouth and their relations to systemic symptoms, especially in regard to the so-called reflex nervous phenomena, and Dr. Hewitt deserves a great deal of credit for suggesting a reasonable basis for investigation along this line. As a practical point it might be suggested that atropin, the physiological antidote of muscarin, be administered in certain of the reflex nervous symptoms seen in pathological dentition.

Dr. Wm. M. Wright, Wilkes-Barre, Pa. I have listened to Dr. Hewitt's paper with a great deal of interest, as I am convinced that these investigations and all those carried on along bacteriological lines relative to systemic infection as the result of faulty oral conditions, are doing much not only to elevate the profession of dentistry to the plane which it deserves, but also to relieve untold suffering and pain for which we, as dentists, must be held responsible, and will continue to be so held, until as a profession we grasp our opportunities and make an earnest effort to eliminate these horrible conditions which exist in the mouths of so many of our patients. What must be the thoughts of a patient who, having come to us for relief, finds later, perhaps after years of suffering, that the cause lies in faulty root-canal work and the cesspools which have grown about the mechanical contrivances which we have placed in the mouth? Speaking of mechanical irritants, I have a few lantern slides showing these ill-fitting crowns and bridges and faulty root-work, all taken from the mouths of patients who were suffering systemically as a result of these oral infections.

[Dr. Wright then showed a number of lantern slides illustrating the conditions just mentioned.]

Dr. D. B. Williams, Wilkes-Barre, Pa. The application of the action of these toxic substances to dental pathology is of a pioneer character, and to most of us mystifying because of our lack of familiarity with them; but no more mysterious than was the whole group of pathogenic bacteria a few years ago. Time may bring familiarity with these.

The essayist says in one of his paragraphs, "A thorough familiarity with the properties and physiological actions of these substances will often give a clue in the search for oral lesions that might cause constitutional reactions." This is no doubt true, but I doubt if there is one man in a hundred in the practice of either medicine or dentistry who has this desired familiarity with this branch of pathology—which means that for the present, at least, the dental profession will not be able to avail itself of these side-lights in our diagnostic work. However, the dentist can at least know of the presence of these dangerous products of faulty metabolism, and strive by perfecting his technique to prevent their defeating the object of his work.

Fortunately for the dentist, the flood of pathology which has swept down upon the dental profession recently has been, in a great measure, accompanied by new methods of aseptic practice, especially in the treatment and filling of root-canals. This makes the outlook for the future very promising indeed, but I cannot but feel that the time is at hand when the dentist will be able to prevent by this improved technique a host of secondary infections which heretofore have had their origin in the dental organs.

The suggestion that certain organic and inorganic acids precipitate earthy salts from the blood, and thereby influence the progress or are primarily the cause of pyorrhea alveolaris, is a most interesting and promising suggestion, for we all know that the stumbling-blocks to the actual, honest cure of pyorrhea are these same earthy salts, mainly because of a rapid re-deposit after their removal, and the fact that the pericemental fiber never reattaches itself when once its grip upon the cementum has been broken. This study of physiological and pathological chemistry will, in my opinion, offer the solution to the pyorrhea problem which vaccines, emetin, and all hypothetical and empirical methods of treatment have fallen short of. In other words, if pyorrhea is ever cured it will be through the solution of the problem of the fault of metabolism in each individual case, and perhaps through a standardizing of the treatment by the study of many cases. I feel sure that it will never be cured by any of the methods now in practice.

Dr. Samuel Doskow, New York. To be able intelligently to discuss the subject before us requires a thorough knowledge of physiology and chemistry, and therefore I am not in position to talk intelligently on the subject. I am, however, in thorough accord with what Dr. Williams has said in closing his discussion, namely, that a thorough understanding of the metabolic activities of the body will bring to light the individual treatment of all oral disturbances that are systemic in origin.

Dr. Hewitt (closing the discussion). This paper is simply an expression of a desire on my part to see "how the wheels go 'round." There are many things in this connection that I do not understand. I have had several cases recently in which there were impactions of third molars, one case particularly, of one upper and one lower right third molar, in which there was absolutely no local pain or inflammation at all. The patient was not conscious that there was anything wrong about the mouth, and yet in the course of treatment having had a radiograph taken for other reasons, I discovered these impacted teeth. The patient was being treated by a physician at the time for nerve lesions. I had three such cases in which the physicians were treating the cases for insomnia, depression, irregular menstruation, distant neuralgia, and other nerve lesions, and in no case was there any local manifestation whatever. In these three cases the impacted molars were taken out, and the symptoms subsided almost immediately in each case. I was particularly interested in one case where it was found that pulp stones were causing reflex neuralgia. It has always been a puzzle to me as to why pulp stones should cause neuralgia. There is no primary infection, and I have wondered how it happens that the reflex pain occurs in the irritation of the nerve terminal. The same thing occurs frequently in cases of reflex pain caused by eye lesions that are purely mechanical and to be controlled by correct lenses. The question to my mind has been, How does that trouble from the tooth cause reflex pain unless it is chemical? As most physiological phenomena are explained by chemical reaction, I suppose we are justified in explaining many pathological lesions in the same manner. We do know that infection causes the majority of these reflexes, but it is possible to have reflexes without a lesion being primarily caused by an infection. It is a well-known fact in surgery that we can have pus that is absolutely sterile, and in the case of an infection about the apex of a root, if the infection be removed it does not necessarily follow that we have eliminated the effects.

Dr. Williams speaks of pyorrhea, and I agree with him most heartily that if we could prevent the formation of calcareous deposits on the roots of the teeth and in the interstitial tissues we would have the question solved, but how to stop it I do not know.

If, however, we should be fortunate enough to discover the cause of these deposits, our next step would be the discovery of a means of preventing its deposition. It is for this reason that I want to point out the value of a knowledge of pathological chemistry.

The meeting then adjourned until Thursday.

THURSDAY—*Morning Session.*

The meeting was called to order Thursday morning at 9.30 o'clock by the president, Dr. Donnegan.

Dr. Donnegan introduced as the first speaker of the morning session Dr. VETHAKE E. MITCHELL. New York, who read a paper entitled "The Artificial Restoration of Lost or Missing Tissues in Congenital Cleft Palate and Other Deformities of the Mouth."

[This paper will be printed, fully illustrated, in the February issue of the DENTAL COSMOS.]

The next item on the program was an illustrated lecture on "Exodontia," by Dr. L. BIDDLE DUFFIELD, Philadelphia, Pa., which was discussed by Dr. C. R. Grissinger, Bedford, Dr. W. C. Middaugh, Easton, and Dr. E. P. Carty, Scranton.

The next order of business was the installation of officers for the ensuing year, after which the society adjourned until the next annual meeting.

Academy of Stomatology of Philadelphia.

Regular Monthly Meeting, held April 25, 1916.

THE regular monthly meeting of the Academy of Stomatology was called to order Tuesday evening, April 25, 1916, at eight o'clock, by the president, Dr. A. P. Lee.

The President introduced as the speaker of the evening Dr. J. LOWE YOUNG, New York, N. Y., who read a paper entitled "The Prevention of Malocclusion."

[This paper is printed in full at page 23 of the present issue of the COSMOS.]

DISCUSSION.

Dr. J. G. Lane. Broadly speaking, the paper may be discussed in one word, and that is, "Amen." Dr. Young has not said anything that could be questioned in any way whatever. He has made a complete and thorough study of this work, and therefore knows exactly what he is talking about.

Let us recall some of the points he has mentioned in his paper. He places great stress upon the need of the study of the occlusion in each individual case, and impresses upon us the importance and absolute necessity of knowing what the occlusion *is* in any given case, as compared with what it *should be* in that same case. It is not sufficient to look at a case and guess that is about "so and so"; that will not answer. Dr. Young's method of studying would permit of no such snap judgment. He insists on having casts of the mouth, and studying the cases in that way. A thorough knowledge of the occlusion in a given patient is necessary not only from the mere viewpoint of knowing what it is, but if treatment of the case is intended, a thorough knowledge of the then present occlusion is necessary before correction is undertaken. We cannot hope to help our patients unless we first know what is wrong, and what needs treatment. Or if the case is not to be treated by oneself, it is necessary to know what is wrong, for the purpose of giving advice, for the purpose of determining whether the proper time for the treatment is now or later, or to decide whether this, that, or the other deciduous tooth should be taken out. The other day a lady told me that her dentist had taken such good care of her child's teeth that they did not decay and fall out; consequently he had taken them out. It is necessary to know the conditions, both present and future, even for the purpose of giving advice. The teeth will exfoliate at the proper time if everything is even fairly normal in the process of eruption and development.

However, as the deciduous teeth do not always exfoliate normally, it is necessary to occasionally remove a deciduous tooth, but not before its permanent successor is ready to put in an appearance, or unless an operation is immediately begun to aid the eruption of the successor. As for studying the advisability or otherwise of extracting teeth that belong to the permanent set, we know there is not much question. The only time when such a question need arise is when there are supernumerary teeth present, and thus two teeth look alike—*e.g.* upper or lower incisors—and then it is only a question of which of the two to extract.

Dr. Young made some mention of restorations or fillings in deciduous and permanent teeth, and also of crowns or bridges. I dare say that everyone in the audience must know the work Dr. Young has done in the line of educating the profession, through the medium of the dental journals, as to the importance of proper restorations from the standpoint of the general practitioner. In one of the slides he showed of a case that had come to him for correction was a filling in an upper right first molar that lacked a large corner. This is typical of many amalgam fillings and other restorations we see that are incorrect—having sloping sides, missing cusps, and little or no normality of interproximal spaces. If we admit at all that the little pressure we put on teeth with fixtures will move them into new positions, then we must admit that anything else that will exert a force on the teeth will move them. Any slight pressure on a tooth—or teeth—is transmitted to the peridental membrane, and the stimulus thus brought about is sufficient to cause a regrowth of the supporting tissues that will be in harmony with the thus coercing environment. Sometimes just a little defect in the accuracy of occlusion will cause the whole denture to be wrong. Only recently I had occasion to advise the repair of an occlusal filling in the central fissure of a lower first molar. I was careful to avoid the permanent restoration until the orthodontic treatment was finished, having it only temporarily repaired with cement during the work of correcting the malocclusion. When the case was finished I advised the mother to have a permanent correction made. She informed me two weeks later that the work had been done. I did not see the patient for six weeks or more; that repair showed a magnificent (?) gold inlay with good margins, but just like a toboggan slide, and showed a burnished place on the inlay where the central fissure ought to be, and the opposing teeth occluded with it—and this was the only place on that side of the mouth where the teeth touched. I thought of Dr. Young's pictures in *Items of Interest,* and of his preaching along this line. It is rather difficult to explain to a mother that this was not done properly—and a very delicate matter to your own feelings to allow such a condition to continue, and to interfere with all of your work. I suppose the reason why Dr. Young did not take up this phase of the work this evening was because he was treating of malocclusion at an early age.

He mentions the possible annoyance of fixtures to the patient. It seems incredible that a lot of fixtures in the mouth can cause so little trouble as we find evidenced. The great secret lies in the matter of having the appliance as consistently simple and small as human skill can make it; and while it may be an annoyance for a short while, the patient soon gets accustomed to it, and forgets its presence. If one gets a particle of food wedged between the teeth it will be very annoying for possibly thirty minutes, but if something happens to take off the mind from it, it will not be noticed any more.

Dr. Young makes a good point in the matter of fixtures, advising fixed appliances so that they will stay where needed to do the work, but it is possible that he has just missed giving you the idea he intended, or I at least got the wrong idea from his description as to why the use of fixed appliances is less likely to cause annoyance, or why the appliance is taken out of the mouth. I do not believe it is so much because of the annoyance as it is the child's curiosity, and also that he thinks it is a good plaything. It is not uncommon to have a child come into the office and say, "George has something in his mouth that he sticks out on his tongue and does this" (illustrating). Moreover, the very fact that a fixture is part of the time out of the mouth and part of the time in the mouth—optionally with the patient—is oftentimes the reason that the fixture is never in position long enough to cease being an annoyance. Going back to the statement made a moment ago, if we have an appliance that has sufficient force to move the teeth and change the arch, it is sufficient to do the *wrong* thing when not in its proper position, or bent out of shape by having been used as a plaything, or while in the patient's pocket or on the school desk.

As to the possibility of the hygienic conditions being better with "portable" than with fixed appliances, I very much doubt whether there would be any improvement. I believe that the child who will not keep the mouth clean with a fixed appliance will not keep the mouth in good condition with any appliance or with no appliance. Dr. Young made note of the fact that the great majority of cases showed no malocclusion of deciduous teeth, which I believe is correct. Then he asks, Assuming this to be true, why is it that there develop so many cases of malocclusion of the permanent teeth? I do not remember his exact words, but he answers the question by saying that the logical answer is the lack of use, that food materials at present are so extensively and elaborately prepared that little or no mastication is necessary; that the child can take the food into his mouth in the form of pastes, swallowing them immediately, as they are premasticated, and we may almost say predigested and pre-assimilated. That very nearly gives the idea, according to his statement, that the entire gamut of malocclusion is pretty nearly due to lack of use. I doubt, however, if he means that. Dr. Ferris of New York has studied out a plan whereby he can make the teeth do work on materials other than foodstuff. He has a series of small soft rubber rods that he gives to his patients, and instructs them to bite upon so many times every day. In other words, make the teeth do some work. If we accept Dr. Young's theory that the lack of use is the principal cause of malocclusion, then the use of the Ferris soft rubber rods might be the preventive medium. It seems to me that there are a lot of other conditions which enter into the question, in addition to the one element of possible lack of actual work done on food materials. Let us consider for a moment the general environment and the general bringing up of the present-day children, and their general living conditions. First of all, consider how they are dressed. It is not uncommon to see a mother going down Chestnut street in the winter dressed in heavy furs; the child with her has bare legs, while the rest of the body is dressed warmly. I saw exactly this condition in my office the coldest day we had last winter. The mother dressed for comfort in the most extreme cold weather, while her delicate little eight-year-old boy, with an adenoid syndrome, paraded in bare legs. This is rather too much of an extreme condition for the young organism to endure. Such extreme changes make the human economy more vulnerable than would obtain if the extremes were more moderate. It seems to me that the matter of present-day dress opens up the gateway for many other conditions to crowd in. These may not particularly mean malocclusions, but have a part to add to the rest in producing dyscrasias that allow other weaknesses to creep in and take hold. The general habits of children, I believe, play a part too. We see them running around on the streets all hours of the first half of the night, when they should be at home asleep. They do not get proper rest, and very soon we see a lot of little pale children with no pink spots on their cheeks, delicate-looking, and something wrong with them nearly all the time. Their general conditions of living are such that pernicious habits easily creep in. There have been mentioned lip habits and thumb-sucking habits: all of these have to do with creating abnormal function in the tissues involved, and this leads to an abnormality in the entire organism. Another habit is the use of the cursed rubber "pacifier." This device many children suck practically all the time. Nature never intended that the cheeks, mouth, and air-passages should be subjected to a continual sucking motion. This is an abnormal condition, and causes a continual change of function. I do not know of anything more conducive to nasal trouble and mouth-breathing than these rubber pacifiers. Were it possible for me to do so I would decree that these curses to children should nevermore be made or sold. I find that by all means too large a percentage of cases that come in are those that have—or have had—trouble in the nose; sixty-some per cent. of my patients, I counted some time ago, have adenoids, and a goodly number have trouble in the throat. There are also to be considered the present methods of heating houses. I find that in steam-heated houses children are more likely to have trouble with the nasal cavity than in houses that are heated with hot air or water. There seems to be a peculiar drying effect on the Schneiderian membrane by which the nose becomes clogged, and the child begins to breathe through the mouth. Many children sleep in overheated rooms heated by steam heat, and in which the atmosphere is dry, burnt out, and excessively used air that is unfit to be inhaled. I notice this effect in my own nose when I have spent a day in a steam-heated building. It does not feel the same as when I am in a house heated by some other means. With all these abnormal conditions brought to bear on children, it is not to be wondered at that they do not grow as they should.

The farther that nature's plan is transgressed the more trouble must be expected. The present-day evolution in manners and customs is by all means too rapid for the evolution of nature to keep pace with, hence maladies must result. It is the exception rather than the rule at the present day to see a child well grown for his age. Nearly all the children look alike, because nearly all look like weaklings. I believe that a lot of maladies and malocclusions could be prevented if the conditions that I have enumerated could be remedied.

Dr. Young mentions the fact that it should be the aim of every practicing dentist to have children of three years and older come to the office for examinations. The thought is a good one, but the task is rather difficult to accomplish. Parents oftentimes will not bring the children—perhaps may think they know more about the child's welfare than we do—and we are thus likely to have some trouble getting them to visit us. But there is someone else who comes in touch with the children before we do, namely, the medical man. The physician should see these things, and it seems to me that he is the man who is in position to exercise great humanitarianism in preventing maladies and malocclusions. However, the general knowledge of the physician on these things is pretty nearly *nil*. He cannot be expected to know them, for he has not, as he should have done, made a proper study of them. I am convinced that the medical colleges are not giving their classes as much instruction as they should in the broad subject of the mouth conditions which we have enumerated, and which have a direct bearing on general systemic conditions and on the nose and throat. A few years age a remark was made by Dr. Mayo that—"The next great step in preventive medicine must come from the dentists. Will they do it?" Digressing from the subject of the paper for a moment, let us note that the dentists are doing it, have been for two or three years, and will continue to do it for some time to come. I am convinced that a large percentage of malocclusions could be prevented by early observations, and as these observations are not within reach of the dentist, then the condition arises that the next great step in the prevention of malocclusion must come from the physicians. "Will they do it?"

Dr. W. A. Jaquette. Dr. Young's paper was presented to us as general practitioners; Dr. Lane's discussion has been from the standpoint of the orthodontia specialist, and I would like to say a few words on the subject from the standpoint of the general practitioner.

I think probably it is a safe statement to make that there is no one here but would feel a sense of chagrin and of great embarrassment if, after he had treated a patient and dismissed the case as finished, the mother came to him and said, "Doctor, I want you to look at these teeth;" then showing some cavities that had been overlooked. I say it would be embarrassing. I think we should have an equal sense of embarrassment and a feeling of lack of justice done to a patient who had been under our care for some time, should the mother say, "Doctor, don't you think my child's teeth need straightening?" I think if we have had the child under our care and watched the development of the face and have not taken the initiative and pointed out these things, we have been fully as neglectful of our responsibility to that child as we have to the other patient whom we were on the point of dismissing with cavities in the teeth.

This presentation is of special interest to us as general practitioners in many ways. At the outset, Dr. Young said that teeth being in proper position increased the resistance to dental diseases. How often have we seen two children of the same family, with apparently like conditions, one with regular teeth and with but a few cavities, the other with irregular teeth and with many cavities. That is only one of the many conditions Dr. Young suggested. I was particularly interested in the statement the essayist made, to the effect that as a rule the deciduous teeth were found in contact with each other and in a great majority of cases occluded properly. While we accept that as a general rule, I think it might be well to emphasize the fact that even though the great majority of cases are found to be occluded properly, yet there are many that develop irregularities very early in life. I recall one case in which a child at the age of two years presented, and it was very evident that an irregularity was developing. At the age of four and a half years the irregularity was so marked that treatment was instituted, and in a short time the correction was complete. That is only one of many cases that develop at an early age. There is no question about the desirability of getting models of cases at various ages, but it is rather difficult for some to make a collection of models taken each year of each child. It is no doubt well to make models and to record any abnormalities that may be found, and watch them in the process of development.

The essayist has shown that if normal development is taking place at the time of the eruption of the first permanent molars, there should be spaces between the deciduous canines sufficient to accommodate the four permanent incisors, and if not, recommendation for the treatment of the arches should be made. While he has spoken of the correction for malposition of mesio-distal relation, I do not think he has given us a sufficiently definite time in the period of development at which the correction of this type of malocclusion should be undertaken.

Just a word about the fixed and removable appliances. The most bulky ones that have been shown on the screen are not in actual weight and bulk within 20 per cent. of what removable appliances of similar character would be, and that feature, of the weight and bulk, has not been mentioned.

Dr. O. G. L. Lewis. I feel that the Academy is to be congratulated on being able to have for its essayist this evening a man of his known ability in his particular branch of the profession. Dr. Young has presented to us a very broad subject, and one which should play a very important part in everyday practice. It is also one which might be discussed under some circumstances at considerable length. If I understand Dr. Young's message this evening, it is that present-day orthodontia should be *prevention* rather than *correction* of malocclusion, and he has presented his case to us in a very thorough and logical way. No one who has had experience in this line of work will deny the fact that it is much easier to move a tooth with a root only partially formed, and where the alveolar process is in the developmental stage, than in a case where the tooth is fully formed. In the first stage we have only to assist and guide the forces of nature, while in the fully formed state we have to undo more or less of the result of misdirected natural formation. Dr. Young has also made the statement that "all orthodontic treatment should be completed by the time the permanent teeth, except the

FIG. 1.

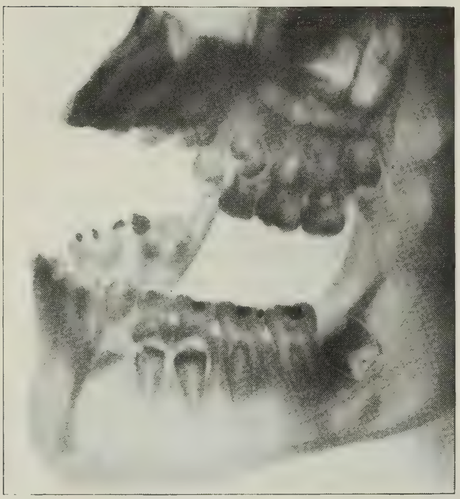


FIG. 2.

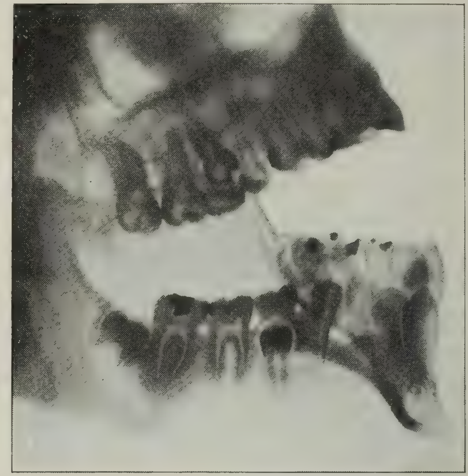


FIG. 3.

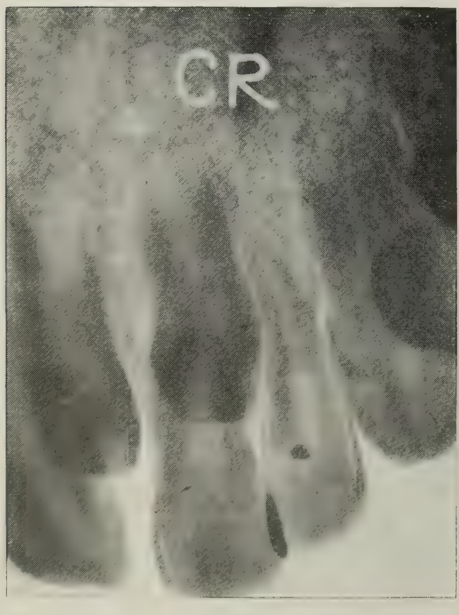
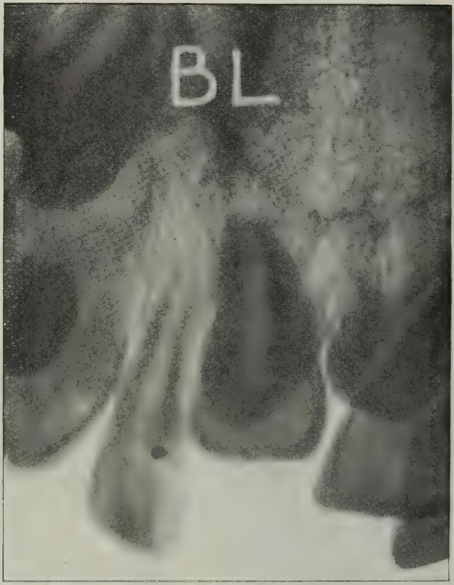


FIG. 4.



third molars, are fully erupted." I wish to ask Dr. Young in this connection to tell us, in closing the discussion, in what proportion, if any, of his finished cases he expects the eruption of these same third molars to affect his result? There is one other thought that Dr. Young touched lightly upon this evening, and yet it is a subject that I believe to be of vital importance to the general practitioner, and that is, the part that impacted or depressed teeth may have in reference to reflexes. By depressed teeth I mean deciduous molars which have been depressed above or below the line of occlusion. Of course by impacted teeth I mean teeth that are held back by some force, and in this connection I would like to show a few slides to illustrate a possible cause of some reflexes.

The patient (H. O., Jr.) came under my care when between sixteen and seventeen years of age. He presented six impacted teeth due to lack of resorption of the roots of the deciduous teeth. The following permanent teeth were impacted: Left upper canine, left upper second bicuspid, left lower first bicuspid, left lower second bicuspid, right lower second bicuspid, and right upper second bicuspid. The left lower lateral was missing; both the deciduous and permanent canines (left lower) were in position. The illustrations (Figs 1 and 2) show lack of resorption of the roots of the deciduous teeth and the complete formation of impacted teeth, with the roots of the lower bicuspids apparently in close relation with the inferior dental canal.

The patient was apparently normal up to the twelfth or thirteenth year, about which time he began to show marked changes in character. He seemed to lose all sense of proportion as between right and wrong. Correction he took as a matter of course; punishment had no effect, and he paid not the slightest attention to either. He "bagged" school for weeks at a time, and yet was sufficiently bright to graduate from Penn Charter School at seventeen years of age. He would go home at night and tell the most wonderful stories of experiences that never happened. He would forget an engagement in a few hours if not reminded of it. He was a most persistent but not vicious story-teller. In less than six months after extraction of the impacted teeth and other required work, he showed marked changes in his general character, and today may be considered normal.

While on the subject of retarded eruption I would like to show two cases of unusual interest. The illustrations (Figs. 3 and 4) represent the anterior portion of the upper arches of twin boys, taken at the age of thirteen, and show clearly the impaction of both central incisors in each case. The impaction is here due to supernumerary teeth.

These are the first cases I have seen where both centrals were retarded in their eruption in this manner.

I wish to repeat in closing that I feel the Academy is to be highly congratulated in having Dr. Young with us this evening.

Dr. Young (closing the discussion). I wish to thank the members of the Academy for the interest taken in my paper. Dr. Lane has well said that the statement in the paper about the lack of use being entirely responsible for lack of development was not intended quite that way, but it does seem to me that medical men are making a tremendous mistake in the advice they are giving to parents about the kind of food they should give to children. I think a great many things enter into the cause of malocclusion, but I did not care to go into that, because it would have made the paper too long. I do feel, however, that the lack of use is one of the greatest causes of malocclusion. It is not to be expected for many generations yet that the physicians will be in a position to properly advise the laity about the development of the teeth and dental arches. They have not been properly trained; they are absolutely not at all familiar with our terminology, but if they were trained and were interested they would be in the best position to educate the laity, because the profession of medicine is much older than the profession of dentistry, and the laity looks up to the former more than to the latter, and more than it will for a good many generations to come. Therefore I have not very much hope of educating the laity from that quarter, and for that reason I have made the plea that it is the duty of the dental practitioner to educate the parents. I believe if we talk to parents we are treating, and ask them if they are looking after their children's teeth, and advise with them in the proper way, we will receive the co-operation of our intelligent patients who have children.

Dr. Jaquette brought out the point about the time for the correction of a case showing abnormal mesio-distal position of teeth in the deciduous set, and I would say that the proper time for such treatment is just as early in life as it is possible to get the appliances on the teeth. You have such an abnormal muscular stress there that you cannot begin too early to get the forces properly directed. I am a firm believer in giving nature as much chance as possible, but when nature is working improperly, then it is our duty to get the occlusal forces working properly as soon as possible, and I believe in many cases this can be done at as early an age as three and one-half years.

Dr. Lewis asked about the effect of the eruption of third molars on a corrected case of malocclusion. I think that wherever the third molars, particularly the lower, are impacted, we are liable to have trouble in the shifting of the teeth even after we have corrected the malocclusion. I recall the case of a young man, a student at Harvard, whose teeth I had corrected earlier, and who came into the office and told me that his teeth were shifting. I looked at his teeth and was convinced that such was the case. The lower canine on the right side had moved forward, and in doing so had carried the four incisors over to the left. I looked at the original models and saw that the six anterior teeth were in proper occlusion when I began the case, so it was not a question of relapsing to the old position, as these teeth had never been in malocclusion. I sent him to have radiographs made, and these showed that the third molars were both impacted, and were trying to erupt, thereby causing the disturbance. In such cases I advise the removal of the third molars. I have not had this happen many times, however. In fact this is the only case in which I felt that I could conscientiously say that the disturbance was due to the erupting third molars, and if that canine had been malplaced when I corrected the case I would have felt less inclined to say that the disturbance was due to the force of the impacted third molars. This case was similar in some respects to the case reported by Dr. Lewis, the case of the twins with supernumerary teeth, only in his case there was more pronounced lack of eruption of the central incisors. This boy came to me at the age of twelve and one-half years, with one upper central not yet erupted. The mother told me that the other central had erupted six months previously. She had a radiograph taken, but it did not show the supernumerary tooth, but by the time he came to me one was showing. Another radiograph was taken and it showed two supernumerary teeth, which were removed. In your case, Dr. Lewis, the lateral had erupted?

Dr. Lewis. Yes, some three years previously.

Dr. Young. In this case both the laterals had erupted, but only one central. The radiograph was taken simply as a check on the supernumerary teeth. The laterals were so overlapped by the centrals that we could not make out the roots of either very distinctly. I brought the two centrals together, put on a retainer, having a wire running on the lingual side and attached to bands on the canines, and I thought with this in place the teeth could not go back. The boy went away for the summer, and when he came back after three or four months, the right central, which was not through the gum at the beginning of treatment, was found to have its root inclined toward the lateral, so I started in to bring the root over again and straighten it up. Shortly after that, in talking to Dr. Angle about the case, he asked if I had had a radiograph taken. I said "No," and he advised my doing so. A radiograph was taken and showed a pronounced resorption of the root, or lack of development, of that central incisor, so much so that I removed the pressure and let the tooth go, and every once in a while I have had a radiograph taken; but the root does not seem to be developing. It does not get any worse, but it is standing at a pronounced angle to the other central. I do not know whether any of you have met with cases of resorption of the permanent teeth, but I have had five cases of resorption, one of which was prior to any orthodontic interference. I do not know the cause, but I am convinced that there was some pathological condition there not due to moving the tooth—because, if it were, we would have many more cases than have been found.

Dr. Lewis wanted me to speak of a case which Dr. Culver showed me this afternoon. I would be suspicious in that case of a habit of some kind being responsible for the position of those teeth. It may not be found that I am correct in that, but I certainly would take the matter up with the physician who advised having nothing done to the child. I would really spend some time to get in touch with him, and show him how little he knew about the use of the dental apparatus. I think there is where some missionary work could be done.

In closing, I wish to again thank the members of the Academy for the interest shown in the paper.

Dr. GARDINER. I move that a vote of thanks be extended to Dr. Young for his very interesting and valuable paper.

The motion was carried, and the meeting adjourned.

Regular Monthly Meeting, held October 24, 1916.

The meeting was called to order at 8 P.M. by the president, Dr. Alfred P. Lee.

The Secretary read the minutes of the last meeting, which were approved as read.

The President then introduced the speaker of the evening, Dr. G. M. DORRANCE, who presented a paper entitled "Alcoholic Injections of the Gasserian Ganglion for Tic Douloureux."

[This paper is printed in full at page 1 of the present issue of the COSMOS.]

DISCUSSION.

Dr. Theodore H. Weisenburg. I have had, in the course of a number of years, quite a large number of cases of tic douloureux which have come to me for various purposes, chiefly diagnosis, and my usual experience is something like this:

The patient comes after having had the pain for some years. The common history is that the pain begins in the upper jaw, usually in one of the teeth, and is almost always sharp, but sometimes of a numb character, and tends to increase and include other teeth. The patient first goes to a dentist, who sometimes has a radiogram made, but more often does not. Usually the tooth is extracted, and in the course of time the patient has practically all the upper teeth removed; then, as the pain goes to the lower jaw, the lower teeth are extracted, one after another, and when the patient finally comes to the neurologist all of the teeth are gone.

To a neurologist, there is no difficulty in making a diagnosis in such cases, because the pain is characteristic. It begins in one tooth, goes to others, and after a while becomes so bad that the patient cannot open his mouth, chew his food, or move his tongue without suffering excruciating pain. You cannot mistake it for anything else. The patients, who are usually women, will not allow anyone to touch them.

Very rarely, we get hold of a patient early, but that is not the rule. Sometimes general practitioners get them in the early stages, and treat them with all sorts of medicine, which does no good. I have tried all sorts of remedies, including injection of strychnin, but none have been of use.

It is always advisable to eliminate other possible causes; have thorough dental, X-ray and metabolic examinations made. Neurologically, it is necessary to eliminate the possibility of brain tumor. If a person has a tumor pressing on the fifth nerve, he will have pain in its distribution. I had a case of this kind some years ago. The patient was a young man, who began to have the typical pains of tic douloureux in one side of the face. He had all sorts of treatment, including alcoholic injections, and was treated in every teaching institution in the city. He then had the fifth root cut and the Gasserian ganglion removed, but without result, with the exception that the pain lessened in the upper part of his face.

The pain in tic douloureux is in the upper part of the face rather than in the lower, and does not go to the neck or shoulder. In this case, however, it did so, so that there must have been more than the fifth nerve involved. After a while this man died, and we found that he had a small tumor which pressed on the fifth nerve, and was so located as to stretch the ninth and tenth nerves, causing an irritation of them. The ninth nerve supplies the back of the tongue, the palate, and part of the throat. Undoubtedly this patient had pain in the distribution of the fifth and ninth nerves, which supply contiguous areas in the face and throat. I afterward saw two similar cases in consultation with Dr. Harvey Cushing. There should be no question of sinus diagnosis if the X-ray is employed.

In a new patient with tic douloureux I give a course of salicylates. If that does no good, after excluding the possibilities mentioned, I send him to Dr. Dorrance, to whom I have sent most of my cases recently.

I think that in a young woman or man it is best to have an injection into the Gasserian ganglion as Dr. Dorrance indicated, rather than into its divisions, because in the latter case the pain always comes back. Therefore I think it is best to get at the ganglion in the beginning. If, however, in a young man the injection is not successful, or if the pain returns, I always advise the removal of the Gasserian ganglion or the cutting of the fifth nerve root, which, in the hands of such men as Dr. Frazier of this city, is altogether a safe operation. It is much better than to have the patient return for an injection every year or so for the rest of his life.

Finally, I wish to pay a tribute to Dr. Dorrance. He has done what so few men do in the preparation of any work. He experimented with the cadaver, using about two hundred specimens, and not until he had done this did he operate upon the human being. This is truly scientific work.

Dr. Thomas G. Aller. There are one or two points that I should like to emphasize. One is the importance of having radiograms taken in all cases of neuralgia that present themselves to you. I want to cite two cases that I have had. In one the lady had suffered from neuralgia for seventeen years, and had had some of her teeth taken out. In fact they were all gone on the right side of her upper jaw. I had a radiogram taken, and found in the upper jaw one root of the right first molar. I extracted that, and found the filament still alive in it. We called this patient up yesterday, and learned that she had had no pain since one week after the operation, which was done about a year ago. The other case was that of a man of forty-eight, who complained of epilepsy and severe neuralgia. When eleven years of age he had had all the erupted teeth in his mouth extracted, one after the other, because of extensive caries, etc., and because he insisted upon it. From that time on, he had worn a full denture. I had a radiogram taken, and there showed in the plate in the lower jaw a second and a third molar impacted on the right side, and also a second and a third molar impacted on the left side. They were extracted, with the result that the epilepsy was relieved and the neuralgia cured.

I feel that in every case of neuralgia one should look for impacted teeth. Dr. Brophy's point was well taken when he said that the great majority of cases of neuralgia are due either directly or indirectly to some disease of the teeth and gums. He mentions pericementitis, pulpitis, sensitive cementum, pulp nodules, malposed teeth, pyorrhea, and edentulous mouths in which the mental foramen gradually comes nearer the surface, the alveolar processes absorbing, the plate worn then pressing down on the nerve itself. He cites cases of broaches protruding through the apical foramina, and also speaks of fillings—gold and amalgam—being in contact and setting up an electric current.

As for the operation of Dr. Dorrance, it seems to me to be a splendid one. The lines he has worked out are certainly very good because they locate in each case the exact direction in which the injection is to be made. It has been my custom to have a skull, and a steel centimeter ruler, near me, so that before the operation the skull may be tilted until it lies in a plane parallel to that of the patient's head; this enables me to get an exact idea of the direction and keep it in mind—the same as one would use a radiogram of a case.

Dr. Dorrance has spoken of sometimes giving anesthesia—morphin, or novocain as he prefers. It seems to me that the administration of nitrous oxid is the best plan. It does away with the patient's worrying. When you get to the nerve and prick it, and then allow the patient to come out of the anesthetic, you cause a marked sensation in the lower jaw, so that you know you are in the nerve; then you can give more nitrous oxid, and when the patient wakes up, you will have made the injection into the nerve, and the patient has the paresthesia you expect.

I believe that when you have to do the major operation, Dr. C. H. Frazier's operation is by far the best, because he cuts the sensory root, which is devoid of neurilemma, and cannot regenerate; it is therefore a physiological extirpation of the ganglion. Doing it in that manner, instead of hooking out the ganglion, as the major operation does, he avoids involving the cavernous sinus and the sixth nerve; and by saving the motor branches of the fifth, he still has the muscles of mastication effective. Then, too, there is much less chance of producing keratitis.

Through the kindness of Dr. Lewis, I have present the patient who was the first man to be operated on for the removal of the Gasserian ganglion in this city. Dr. Dorrance spoke of him when he mentioned that Dr. Keen, in 1894, did the first operation of this kind. This gentleman was graduated from the Philadelphia Dental College in 1882. He tells me that his neuralgia started thirty-eight years ago. He had had fifteen operations, and had tried one thing after another; then, feeling that he had rather die than endure the pain any longer, he had Dr. Keen remove the Gasserian ganglion. In performing this operation the cavernous sinus was cut, and the patient had a severe hemorrhage. The opening was packed with iodoform gauze, and the operation was discontinued. The patient's life was despaired of for several days. The operation was begun on Wednesday, and on the following Saturday they removed the gauze and continued the operation. The patient survived. He tells me that he has felt great relief, but he also says that he has occasional fleeting pains in the head. You cannot, however, get him to localize the pain. This disease has broken up the man's entire life. I am sorry he has just left the room, because I think you would have liked to see his condition and the various scars that he shows. The upper right maxilla has also been removed in an attempt to relieve him.

Dr. Carlton N. Russell. I was much impressed with the thoroughness of the technique of Dr. Dorrance at the different ganglia and the points of entrance of the nerves. Injection of the ganglion is a practice that is becoming quite prominent, and is, to a certain extent, efficacious. I think that Dr. Weisenburg should have qualified his remarks a little relative to the immediate injection of the Gasserian ganglion. It is not hard to do this later, and I have seen but a few cases that have not been relieved by this operation. I am sorry that Dr. Aller's patient is not here tonight, as he would afford an illustration of the effect of removal of the ganglion. There was no statement made as to the condition of the patient previous to the operation, whether there was peripheral irritation or dental irritation. That has a great bearing on the result of injection. An elderly person cannot stand much shock of operative interference such as accompanies these irritations, and you are obliged to obtain the results with the least possible amount of shock. Sometimes, in the early stages, it is well to feel your way. You cannot always get to the Gasserian ganglion, but frequently, by means of external injections merely, very definite results can be brought about, often rendering the more serious operation unnecessary. I have cases in which four years have intervened without any recurrence of the symptoms. Sometimes results are secured by infiltration of the foramen ovale. I have a case in which, with very little shock, the patient was relieved of a most distressing condition two years ago. You cannot say to the patient, "You must have this done," because I believe that if definite results can be secured with a minimum amount of trauma, this should be done. I have frequently injected into the exit of these nerves from the base of the skull without getting the desired result. Later, however, I again injected where the amount of bony structure was least, and it seemed as if the two injections combined gave the result sought for. I could recite two cases in which the deep injections have failed, probably by failing to get into the nerve; but this is not necessary, if you get into the nerve sheath.

In one patient, an old lady, an external injection was made, and a year and a half intervened before another was necessary. The patient during that time was entirely relieved of the trouble. Therefore I rather feel that the so-called radical measures are to be approached with a great deal of deliberation. If you start on peripheral nerves, then go in at the point of exit, and if this fails, go into the deep ganglion, you will avoid these unpleasant sequelæ.

Dr. G. L. S. Jameson. I should like to refer to a case that I had three years ago. The patient had what was considered to be tic douloureux. The pain became so great that we thought the woman would lose her mind. She had the teeth on the lower left side extracted, then the pain began in the second bicuspid on the opposite side. I destroyed the pulp in this tooth, but she still had pain. We had an X-ray picture taken, and it showed a third molar impacted and inverted. We decided to take the patient to the Jefferson Hospital for operation, and there, with the help of Dr. Thomas and Dr. MacCuen Smith, we drilled into the bone. The tooth dropped and Dr. Smith could not reach it. I had with me a number of dental instruments; and with an excavator, we worked around under the tooth, which was loose in the cavity, and finally got it out. Without exaggeration, that tooth and its sac were an inch and a half long. The hole was large enough to put your finger in.

Afterward, the patient had a great deal of neuralgia. I was called to the hospital, and found that they wanted me to extract the second bicuspid. I told them that I had destroyed the pulp of this tooth already. I believed that the pain was due to the fact that the inferior dental nerve had been exposed. The patient recovered in a short while, and has had absolute comfort from that day to this. The operation was performed fifteen years ago. She suffered for two or three weeks after the operation, however, and we had to resort to medication to carry her through that period.

Dr. Sausser. I should like to add the history of two cases that might be interesting to you. One was that of a man, in whom I became much interested, because of his great agony. Dr. Weisenburg's description of the suffering caused by tic douloureux was, I think, putting it mildly. It is an extremely agonizing condition. In these two cases I was intimately associated with these men during their attacks, which came on with such intensity that they could not think of what they had said the moment before or continue the conversation. Anyone who sees a person suffering from an attack of tic douloureux cannot help being impressed with the severe agony it produces.

The first patient was of an inventive nature, and had been working with liquids at low temperatures. He claimed that while working with these he had contracted the disease from which he had afterward suffered. I induced a good oral surgeon to take an interest in him, and an injection of the ganglion was made eight years ago. It was done from within the mouth, the needle being injected posterior to the malar tuberosity. The operation was performed without an anesthetic before a great body of men, and no antiseptic precautions were taken before the injection, with regard to cleansing the mouth. The man did fairly well in the hospital until the sixth day following the operation, when he contracted a condition similar to brain fever, and his life was despaired of, but he survived. He afterward went through two or three other treatments, the last of which was the removal of a portion of the intestines, a passage being opened externally at McBurney's point, and kept open, with the idea of flushing the bowel externally and removing the accumulation of poisonous material daily. In this way it was thought that his neuralgia, or tic, would be relieved. He claimed that after this washing of the bowel there was an apparent relief from headache. The headache he had not before associated with the tic, but it was apparently associated with the condition of the intestines, because there was relief from it after these washings. I think this case is interesting because the man passed through so many kinds of treatment, the last of which was rather startling for a "tic" case. The patient died two years after the last operation.

The other case was one of tic douloureux that came on without any known cause, and the condition was aggravated during mastication. This latter fact immediately interested me. When we talk of a thorough examination of the mouth for tic douloureux it seems like an easy thing to do, but I do not believe that any man can decide that this tooth or that is the particular tooth causing the pain. In this case I found two pulp chambers filled with pulp stones; this condition was remedied, but there was no relief from the pain. There had been only one extraction in that case. Two injections were made superficially, with little relief—one in three months after I saw the case, and the other in about four months. Then he fell into the hands of Dr. Dorrance, and has had relief for two and a half years. The operation performed was an external injection. This man suffered, as did the first, from excruciating pain. When enduring these attacks the patients appear to lose all sense of anything but the pain for the time being.

Dr. W. J. Robinson. Several years ago I had a lady patient who came to me suffering the pain so well described by Dr. Dorrance. She had suffered for fifteen years, but for eight years had been unable to smile, eat, or wash her face without starting up what she described as shocks of the most excruciating pain, which would last some time, and finally leave her exhausted. She was continually under the care of physicians and dentists, and received all kinds of treatment from them, but obtained little or no relief. After hearing the history of the case and making an examination I discovered that a bicuspid was missing, and suggested that a radiogram be made, which she immediately had done. The radiogram showed the impacted bicuspid, which was removed. After the removal of the tooth the patient was comfortable for about three months, but finally the shocks of pain returned.

Dr. Russell was called into consultation and we agreed that it was a case of true tic douloureux. Dr. Russell made an external injection, which so far has proved successful, for after the lapse of several years the patient has had no return of pain.

I have assisted Dr. Russell in making several injections in cases of tic douloureux, which I have followed up for a number of years, and from my observation of the treatment I believe it to be a successful procedure. I wish to thank the essayist for the very clear and able manner in which he has presented his technique of operation.

Dr. Dorrance (closing the discussion). Professor Bier recommended hot air in the treatment of neuralgia. If you were to read the literature on the subject that I have read, you would think that there had been a lot of "hot air" used in the case of tic douloureux.

This is a pain of the fifth nerve for which you cannot find a cause. It has a typical course, but you have something that simulates it, brain tumor or cyst, and after you remove the cyst or the impacted molar the patient may have pain for some time. That is because you have a neuritis of the nerve, but this will quiet down shortly after the removal of the third molar or other condition present. You may give an alcoholic injection, and find that the patient does not have pain for some weeks; you think you have removed the cause, but in "tic" you have not.

I did not recommend osmic acid because the pain produced by injecting that is terrific, and the patients are not willing to submit to a second injection. With the alcohol, however, they do not object to having the second injection made, and will come back for it.

I differ with Dr. Weisenburg. Of course, if it is a typical case of tic douloureux, with several branches of the nerve involved, I go right in after the ganglion without question; but if it is only one branch, just starting, then I inject that nerve outside the ganglion, and so far, I think the results in my cases have justified me in this course. I do not mean that I inject peripherally, but just outside the ganglion, which is really very deep in.

In regard to the question of examining these people in order to see whether they have dental troubles or not, I would say that if the patients have tic douloureux and you touch them on the face, they will hate you. I have seen them try to hit their heads against something in order to relieve the pain, because their agony was so great. You cannot examine their mouths or touch them while they are having an attack. I usually give these patients nitrous oxid to make the examination, and take the X-ray picture under ether. Then I inject the ganglion, and if this procedure is not a success, I am suspicious of the existence of brain tumor. I have had cases in which I failed, and could not understand why. There will be a certain number of recurrences after alcoholic injections.

I have seen corneal ulcers result from operations on the Gasserian ganglion; I have seen the eyes taken out. We should always be careful not to do harm when trying to do good. Most of us can take out the Gasserian ganglion. It is nothing very terrible to do. It is a bad thing, however, in an old woman. She has only a few years of life left, anyhow, and if you can give her two or three years of comfort, it is better to do it.

Dr. Jameson probably had a cyst under the tooth, and the inferior dental canal of the fifth nerve was encroached upon. I use the injections in the fifth-nerve neuralgias, but I make the injections deeper for tic douloureux, and if the case be a severe one, I inject the ganglion—never with acid, but with 70 per cent. alcohol.

Only the other day I made such an injection. I had injected it before, and had at first produced a nice anesthesia, but when I injected again, I found that the anesthesia had almost disappeared, with recurrence of the pain. I had not put enough alcohol in to destroy the entire ganglion, nevertheless the pain disappeared, and the patient was satisfied.

Dr. Lewis moved a vote of thanks to Dr. Dorrance for this interesting presentation, and that the thanks of the Academy be also extended to Drs. Weisenburg, Aller, and Russell.

The motion was seconded and carried, and the meeting adjourned at 10 P.M.

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

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PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, JANUARY 1917.

EDITORIAL DEPARTMENT

An Instance of the Survival of the Fittest.

A FEW months before his untimely decease, in December 1915, Dr. Piercy B. McCullough submitted for the writer's inspection a collection of five or six extracted teeth, consisting of upper canines and lateral incisors, and as, upon casual observation, these teeth presented no unusual features, inquiry naturally arose as to what, if any, points of interest the specimens possessed. Whereupon Dr. McCullough explained that they were interesting for the reason that each tooth had been the sole surviving member of a complete denture in the mouth of one of an equal number of separate individuals, and as single remaining teeth he had removed them in order to supply the patient in each case with an entire artificial denture;—the teeth were therefore interesting, in the first place, as individual examples, in a dental sense, of the biologic law of the survival of the fittest, and secondly the specimens possessed an additional interest from the fact that their pulp chambers and root-canals had been filled from thirty to thirty-five years ago with cotton wool saturated with beechwood creasote, the operations having been done by the late Prof. J. Foster Flagg, to a large portion of whose *clientèle* Dr. McCullough had fallen heir.

Those having the good fortune to have personally known the late Professor Flagg will attest the fact of his faith in the use of cotton impregnated with creasote as a permanent root-canal dressing, and will remember that the employment of that method was widespread not only among those who followed the teachings of Flagg but among many others who had never sat under his instruction. Indeed, the practice of filling root-canals with creasoted cotton antedated the time of Dr. Flagg—for Dr. E. T. Darby has recently reported to the writer having removed such a dressing from a central incisor root in a patient well past the allotted span of life, who upon inquiry as to the date of the original operation stated that the root-canal dressing had been inserted sixty years previously by Dr. Thomas W. Evans in Paris. Inquiry among several colleagues has elicited the fact that these instances are by no means rare, and that not infrequently practitioners at the present time have occasion to do restorative operations upon teeth whose root-canals, often much to their surprise, are found to have been filled with cotton and creasote, and that such teeth have been giving long and comfortable service.

It is perhaps superfluous to state that it is not the purpose of this writing to advocate the filling of root-canals with creasoted cotton, but merely to direct attention to the facts and to consider somewhat their suggestiveness. As to the fact that in the five or six cases collected by Dr. McCullough, representing as the specimens did the ''survival of the fittest'' of the entire denture in each case, it may be urged in rebuttal that the other teeth of these dentures presumably treated in the same way in so far as their root-canals were concerned were lost, and, reasoning from the standpoint of the same biologic law, were equally representative of the destruction of the unfit, which naturally leads to the final deduction that the unfit being in the glorious majority furnishes indisputable proof that creasoted cotton is a failure as a root-canal dressing. Such a deduction is, however, lacking complete support, inasmuch as it is in evidence that pulpless teeth with root-canals dressed with creasoted cotton have given comfortable and efficient service for thirty-five and even sixty years. We are bound, therefore, to consider the outstanding fact of the known success of this method of root-canal treatment, and to determine, if possible the factors which made it a success, even though its record as a success may have been a limited one.

A high authority has quite recently said, "Opinion is more than ever the queen of the world"—and granting the dominating influence exercised by opinion in determining action, it will doubtless be conceded that one of the most difficult undertakings is to alter or change a mode of procedure when directed by a so-called "point of view" which represents a more or less permanent mental attitude. The whole operation of root-canal treatment has been apparently considered by the dental profession from the standpoint of the root-canal filling with the emphasis on the filling, *i.e.* the obliteration of the space represented by the central pulp cavity and root-canal by the mechanical means of filling it with a material, unchangeable substance that will permanently act as a barrier to subsequent bacterial invasion. Such has been the attitude of the dental professional mind, generally speaking, until recent years and since the growing importance of the application of the principles of aseptic surgery to root-canal work has come to be more and more recognized. Today the place of the filling in root-canal work is being more clearly defined, and the fundamental truth that complete asepsis of the canal is an essential prerequisite to successful canal filling is now scientifically established. In this view of the case asepsis of the canal becomes of primary importance, and the canal filling takes its place as a factor of secondary consequence. The dominance of the importance of asepsis in root-canal work is significant in that it furnishes one more illustration of the fact that the mechanical ideal in dentistry must give place, is rapidly giving place, yielding first consideration to the biologic factors which constitute the vital aspects of all dental procedures.

Those of our professional forebears who treated and permanently filled root-canals with creasoted cotton builded better than they knew, for it cannot be doubted that the persistent mild antiseptic potentialities of beechwood creasote created a field immune to bacterial invasion even though the cotton vehicle which carried it was mechanically imperfect as a filling compared with the impermeable and unchangeable materials now in standard use for the same purpose.

BIBLIOGRAPHICAL

THE PRINCIPLES OF BACTERIOLOGY. A Practical Manual for Students and Physicians. By A. C. ABBOTT, M.D., Professor of Hygiene and Bacteriology and Director of the Laboratory of Hygiene, University of Pennsylvania. 12mo, 650 pages, with 113 illustrations, 28 in colors. Cloth, $2.75, net. Philadelphia and New York: Lea & Febiger, 1915.

The changes from the eighth edition, while numerous, have not affected the general character of this work. It remains the text-book *par excellence* for the beginnner in medical bacteriology. The laboratory (experimental) method is kept constantly in mind and forced repeatedly upon the student's attention. The introductory historical chapter is unchanged, remaining easily the best short sketch, from the purely medical standpoint, of the progress of human knowledge upon the infectious diseases. More detail than usual is given to the use of animals in bacteriological investigations.

The greatest change from the preceding edition is the transference of the chapter on Infection from near the end of the book to a more logical position, *i.e.* introductory to the descriptions of individual pathogenic species, and the addition of an entirely new chapter on the Hemology of Immunity (Chap. XV). These extremely abstruse subjects are treated clearly and with originality.

It may be a cause of surprise that the section on Streptococcus pyogenes contains no suggestion of the immense amount of work which has been done on this important and puzzling group.

The description of the methods of isolating B. typhosus, the section upon immunity against B. Pestis, and that upon tetanus antitoxin have been rewritten, bringing the work up to date.

The form of the book is an improvement over the previous editions. The use of heavy type for designating the topics is a decided advantage. The illustrations for the most part are the same as in the eighth edition, except that new ones have been added in the section on the Defenses of the Body. The polish of the diction and the clarity of exposition enhance the instructional value of the book.

Books Received.

Books received are acknowledged in this column, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

"Mouth Hygiene: A Course of Instruction for Dental Hygienists. A Text-book Containing the Fundamentals for Prophylactic Operators." Compiled by ALFRED C. FONES, D.D.S., Bridgeport, Conn. Edited by EDWARD C. KIRK, Sc.D., D.D.S., LL.D., ROBERT H. W. STRANG, M.D., D.D.S., and ALFRED C. FONES, D.D.S. With 278 illustrations and 7 plates. Philadelphia and New York: Lea & Febiger, 1916.

"Essentials of Operative Dentistry." By W. CLYDE DAVIS, M.D., D.D.S., Dean and Professor of Operative Dentistry and Technic, Lincoln Dental College, Lincoln, Nebr. Second Edition, revised. St. Louis: C. V. Mosby Company, 1916.

"Oral Abscesses." By KURT H. THOMA, D.M.D., Lecturer on Oral Histology and Pathology and Member of the Research Department of Harvard University Dental School; Instructor in Dental Anatomy, Harvard Medical School; Oral Surgeon to the Robert B. Brigham Hospital, Visiting Dental Surgeon to the Long Island Hospital, Consulting Oral Surgeon to the Boston Dispensary. Boston: Ritter & Co., 1916.

"The American Year-book of Anesthesia and Analgesia." F. H. MCMECHAN, A.M., M.D., Editor. Price $4.00. New York City (93 William st.): Surgery Publishing Company, 1915.

"A Text-book of Human Physiology, Including a Section on Physiologic Apparatus." By ALBERT P. BRUBAKER, A.M., M.D., Professor of Physiology and Medical Jurisprudence in Jefferson Medical College; formerly Professor of Physiology in Pennsylvania College of Dental Surgery; formerly Lecturer on Physiology and Hygiene in Drexel Institute of Art, Science, and Industry. Fifth Edition, revised and enlarged, with 1 colored plate and 359 illustrations. Price $3.00. Philadelphia: P. Blakiston's Son & Co.

PAMPHLETS.

"Contribucion al Estudio de la Ránula Lingual." By Dr. RAMON TEJADA AGUIRRE. Guatemala: Tipografia Sanchez & DeGuise.

"On the Structure and Arrangement of the Enamel Prisms, Especially as Shown in the Enamel of the Elephant." By J. HOWARD MUMMERY, D.Sc.Penn., M.R.C.S. (Reprinted from the Proceedings of the Royal Society of Medicine, 1916, vol. ix (Odont. Section), pp. 121–138.) London: John Bale, Sons & Danielsson, Ltd., 1916.

"X-ray Illustrations Showing Abnormal and Diseased Dental Conditions." Compiled from the Records of the Boston Dental X-ray Laboratory. By JACOB J. LOWE, Managing Director, in Collaboration with Chas. H. Tozier, S.B., M.D.

"Roentgenologic Examination in Elimination of the Mouth as a Source of Infection in Systemic Disease." By E. J. EISEN, D.D.S., Milwaukee, Wis., and ROBERT H. IVY, M.D., D.D.S., Milwaukee, Wis. New York: Paul B. Hoeber.

"Chronic Mouth Infection in Relation to Systemic Disease." By ROBERT H. IVY, M.D., D.D.S., Milwaukee, Wis.

REVIEW OF CURRENT DENTAL LITERATURE

[*International Journal of Orthodontia*, November 1916.]

A Study of the Cubic Capacity and Superficial Area of the Maxillary Sinus.

By V. LOEB.

Loeb's material was from twenty-one skulls. He describes the technique of making the models of the antra in plaster, which is simple, and as accurate and dependable as that used in the wax-plate reconstruction of organs. The heads were all of adults, but no previous history could be secured.

The right and left of each pair of sinuses are more or less symmetrical, but vary in size. They are roughly triangular in shape, with apex posterior, and with all the walls practically triangular except the internal, which is more or less quadrilateral. While the two sinuses of one head are usually similar, they differ materially from those of any other head.

The cubic capacity was measured by displacement of water. The average of 21 right antra was 13.02 cc., that of 21 corresponding left antra 12.85—*i.e.* an insignificant difference. The extremes were 4.5 and 24.8 cc.

The superficial area was determined by carefully covering the models with adhesive plaster and measuring the amount needed.

The average superficial area was 32.91 sq. cm., of the 21 corresponding left antra 30.43 sq. cm.—*i.e.* an insignificant difference. The extremes were 12.1 and 52.3 sq. cm.

These figures indicate the extreme variations in size and shape of the sinuses in the respective heads. This could not be anticipated from an observation of the heads used before the sinuses were exposed. There seemed to be no connection whatever between the size of the head, contour of the face, or any anatomical landmark, and the size or shape of the sinuses.

This study would seem to show that expansion of the dental arch cannot affect the size of the maxillary sinus in any way. Also this work revealed the roots of only a few teeth—principally the first and second molars—penetrating into the sinus. It was not at all uncommon, however, to find only the frailest partition of bone over the apices of the teeth. Abscesses in such teeth might easily have affected the sinus.

While it has been a matter of common knowledge for a long time that the maxillary sinus varies in regard to size and form in different subjects and even in the two sides of the same subject (Cryer, "Internal Anatomy of the Face," 1916), still Loeb's research expresses these basic anatomical relations possibly more vividly and graphically than ever before.

[*Pacific Dental Gazette*, November 1916.]

The Relation of Affections of the Teeth to the Work of the Rhinologist. By C. H. Montgomery.

The subject of this essay is a somewhat neglected topic. The points of special value in Montgomery's report are perhaps those which are the outgrowth of his own experience and general attitude. He records a case of a woman, age forty, who had had three distinct attacks of "sore throat" within one year, also had been treated by four physicians and two dentists for rheumatism, sore throat, and pyorrhea. In reality she had a most severe membranous-mixed infection of the buccal and pharyngeal cavities, due to a recurrent exacerbation of the pyorrheal condition of the teeth. When this was properly combated, convalescence ensued.

As regards the interrelation of antral and dental disease, Montgomery is convinced that its diagnosis is "a very much bungled procedure." His simple method is resolved into two steps—(1) exploratory puncture (underneath inferior turbinate, with small Nyles exploratory trocar into the antrum and by lavage of antrum establishing presence or absence of pus), and (2) use of the radiograph. He places no dependence on transillumination. The radiograph is not resorted to unless the question of dental causation of the antral affection comes up in the individual case. The method of puncture is so rapid, simple, relatively painless, and above all so exact, that Montgomery prefers it.

He protests against antral drainage by way of a tooth socket. It simply means that then the rhinologist has to care for two infected cavities—antrum and mouth—instead of as originally, simply one—antrum. Frequently cases arise when a tooth must be extracted and the neighboring necrotic alveolar portions removed, with utter disregard of opening into the antrum or not. But in such cases the wound should be so closed that the antrum is shut off from the mouth, and if necessary drained through the nose. Montgomery gives in brief one striking case.

The dental origin of antral infection is relatively rare. In a series of 145 consecutive cases in private practice (rhinology) only about 5 per cent. proved to have a dental origin. Montgomery has never seen or known of an infection of the frontal, ethmoid, and sphenoid sinuses, secondary to and as a direct result of badly infected teeth.

[*Wisconsin Medical Journal*, October 1916.]

Symptoms and Diagnosis of Accessory Sinus Disease. By A. G. Kreutzer.

There is only a brief section of this paper which is of interest, in relation to the above-mentioned essay of Montgomery. Kreutzer agrees with the former author that exploratory needle puncture is the only method which will give definite information. While Montgomery maintains that only 5 per cent. of antral infections are traceable to the teeth, Kreutzer increases that percentage to 20 and even 30. One final pertinent observation is that empyemas of infectious origin do not secrete as freely as a rule as those of dental origin. The pus from an acute sinusitis of dental origin is often more fetid, and contains caseous matter.

[*Journal of the American Medical Association,* November 18, 1916.]

Weakness of the Soft Palate, a Constant Symptom in Hemiplegia. By P. DeLong and T. H. Weisenburg.

These authors studied about one hundred cases of hemiplegia in which there was involvement of the lower part of the face, a number of cases of diplegia, and pseudo bulbar palsy. In about 80 per cent. of the cases of hemiplegia the uvula generally points away from the paralyzed to the normal side, and the palatine arch, because of the relaxation or loss of tone of the musculature, loses its normal concavity and appears flatter and wider. In about 10 per cent. the arch appears narrower on the paralyzed side. In the other 10 per cent. physical reasons prevented the obtaining of a satisfactory view. In phonation the soft palate on the paralyzed side appears to give way, and the arch of the palate goes back and toward the normal side. As concerns the tongue, its position when lying in its cavity and its action when protruded were studied. The tongue on the paralyzed side loses its elasticity and is flabby to touch and pressure. When lying in its cavity, the posterior part appears to be thicker and not so wide in comparison with the normal side, this being especially noticeable when the tongue is protruded.

In the cases of diplegia the investigation of the palate and tongue were unproductive, chiefly because of lack of comparison with the normal.

In the cases of pseudo bulbar palsy the findings were practically those of hemiplegia.

[*Deutsche Monatschrift fuer Zahnheilkunde,* July 1916.]

Conductive Anesthesia of the Maxillary Nerve. By Rattel.

Conductive anesthesia is relatively easily induced in the mandibular region by a single injection. To induce it in the maxillary region it is usually necessary to make several injections. A consideration of the anatomical relations of the second branch of the fifth nerve (N. maxillaris) indicates that if a single injection is to induce anesthesia in the field innervated by this nerve, the anesthetizing fluid must be injected immediately distad to the exit of this branch from the foramen rotundum. On a skull the easiest access to this location is through the orbit at a depth of about 5 cm. This method has already been proposed and practiced, but is scarcely feasible for general dental practice.

A second method is to penetrate with a curved needle behind the third molar to the maxillary tubercle about 3 cm. in depth, and deposit the anesthetizing fluid in the spheno-palatine fossa. For numerous reasons this method is judged inexact, possibly dangerous, and generally unsatisfactory.

The third method is technically simpler. The point of injection is outside the oral cavity. It is through the gap bounded below by the incisura semilunaris of the ascending ramus of the mandible, above by the zygomatic process—which gap is oriented by palpation. The needle used in this case is 6 cm. long.

In Rattel's opinion, a fourth method (Matas) is the most desirable in dental practice. The point of entrance for the needle lies close behind the lower palpable angle of the body of the malar bone. From here the needle is pushed inwardly and upwardly at an angle of about 30 to 35 degrees. Its point penetrates the masseter and meets the maxillary tubercle. Along the surface of this, one's way is easily felt. Suddenly the needle glides deeper and enters the pterygo-palatine fossa, meeting the nerve (2d branch of fifth) at a depth of 5 to 6 cm. To locate exactly the point of injection in this method Rattel has observed that the upper margin of the malar bone and the lower margin of the orbit are in one plane; that if a perpendicular be erected upon this plane, tangentially to the lateral orbital margins, and if this perpendicular be extended downward until it cuts the lower margin of the malar bone—at this intersection will be the indicated point of injection. In the living subject the foramen rotundum lies at a distance of 5 to 6, rarely 7 cm., from this point of injection.

Rattel carefully and in detail describes his application of the above considerations upon the patient. When the needle point is in the proper position, the patient always experiences radiating paresthesias in the cheek, teeth, or nose. It is of the highest importance to be on the lookout for these paresthesias when the needle is 5 to 6 cm. deep, and when once these have occurred to go no farther.

Rattel usually has good results by the injection of 2 cc. of a 1 or 2 per cent. novocain-suprarenin solution. The most important factor is not the volume of the solution, but correct technique. The temperature of the solution to be injected should be maintained as near as possible to the body temperature. Before operating usually 20 to 30 minutes should elapse from the time of injection. This period of waiting of course varies greatly with the accuracy of the technique.

Rattel has used this method in about 350 injections, which he analyzes in this report, and does not minimize the observed unfavorable accompaniments of the injection. However, these disadvantages are common to all methods, and do not invalidate the superiority of this particular technique.

[*Journal of Infectious Diseases*, Chicago, November 1916.]

Experimental Studies with Endamœba Gros. By F. Hecker.

Hecker first describes a very complicated technique for the isolation of the endamœbæ, free from all bacteria, from the pus of pyorrhea alveolaris. Having thus secured these organisms, *alone*, he injected them in amounts varying from 5 to 18, into the gingival space of the left and right upper and lower central incisors, mesio-approximal and distal surfaces, of six guinea-pigs. On the second and third days respectively three of these showed a slight inflammation of the gingivæ. The other three did not manifest inflammation, pus, or the presence of endamœbæ during a period of eighty-four days following the injection.

Hecker made a number of similar experiments on himself—injecting up to 14 active endamœbæ into the gingival space around the lower six anteriors and the four upper anteriors of his own mouth. Examination over about four months failed to reveal gingival inflammation, pus, or endamœbæ.

Hecker's conclusion is that—"The gingival space of the guinea-pig and the healthy gingiva of man when inoculated with active endamœbæ do not develop inflammation or pus, and the endamœbæ do not survive to reproduce the species. Hence, at this time, we cannot accept the theory that this protozoan, when found in the pus around the root of a tooth affected by pyorrhea alveolaris, is etiologically responsible for the production of this malady."

While it would be easy to raise objections to Hecker's conclusions, this article deserves serious attention, because it is apparently the first attempt published to test experimentally the amœbic theory of pyorrhea alveolaris.

[*Ophthalmology*, Seattle, October 1916.]

Keratitis Neuro-paralytica Resulting from Alcoholic Injections for Facial Neuralgia. By Ed. E. Maxey.

The case reported is that of a man, age forty-four, from whose lower lip a growth had been removed by arsenical paste. Shortly afterward neuralgic pains were felt in the left mandible, radiating to the region of the left ear. The mental nerve was resected at the foramen. This gave two months of relief, when the pains returned worse than before, involving practically all the area supplied by the inferior maxillary division of the fifth nerve. A few months later the superior maxillary division was entirely involved. Eight alcohol injections at a few days' or weeks' intervals temporarily relieved the pain, which, however, returned, accompanied by anesthesia and paralysis of the left side of the face, including the eyeball and lids.

Examination revealed, as a result of the paralysis and anesthesia, marked lagophthalmos, ectropion of lower lid, inflammation of the entire conjunctiva, slight muco-purulent discharge, no lacrimation, a suppurating ulcer almost covering the cornea, a turbid aqueous, and a small hypopyon at the lower angle of the anterior chamber. Enucleation was necessary.

Maxey's interpretation is as follows: The chief causal factor of the original neuralgia was the arsenical paste. The eye condition was either a keratitis neuro-paralytica or a keratitis lagophthalmos, or both. The alcoholic injection undoubtedly caused the paralysis and anesthesia. In the effort to reach the second division of the fifth nerve at the foramen rotundum, some of the alcohol entered the orbit, producing the subsequent train of eye lesions. The first division, or ophthalmic, probably was not injured.

[*Journal of the American Medical Association*, November 18, 1916.]

The Treatment of Malignant Disease About the Mouth by Combined Methods. By G. E. Pfahler.

Proper stress is placed on prophylactic measures. It is important that the dentist thoroughly appreciate their value, for he usually is the first to whom is given the duty and privilege of initiating these measures. Jagged teeth should be removed or treated. Pyorrhetic ulcers should be eradicated. Leukoplakia and smoker's stomatitis demand the cessation of smoking, and in the former the elimination of syphilis. Oral ulcers in patients with a history of syphilis must yield to anti-syphilitic treatment or arouse suspicions of malignancy. Ulcers, fissures, crusts, or warts on the lower lip or at the angles of the mouth which do not disappear within three weeks should be destroyed by electrothermic coagulation, followed by X-ray treatment locally and on the glandular area under the jaw (*vide infra*).

At present, thorough prophylactic measures often fail to be instituted, with the result that the condition when first presented is malignant. It is to such cases that Pfahler here gives most of his attention.

His conclusion is that combined treatment by two or more of the following procedures—surgery, electrothermic coagulation, radium, and deep radiotherapy—will cure some patients who otherwise are hopeless.

In electrothermic coagulation the d'Arsonval current is generally used, or a combination of the d'Arsonval and Oudin currents; 1000 to 2000 milliampères are necessary. The shape and character of the electrode will vary with the character of the work. Electrothermic coagulation is indicated (1) where disease can be completely destroyed locally without regard to saving bloodvessels or nerves, (2) where local destruction of oral disease is possible with surgical removal of diseased cervical glands, and (3) doubtfully in sarcomas. Here deep radiotherapy alone will give better results than the combination of these two agencies. Pfahler details the advantages and disadvantages of electrothermic coagulation.

Early lesions about the mouth can be destroyed by this agent with less loss of tissue than by any other means. Deep radiotherapy should be added to any other method of destruction or removal of malignant disease. It is employed over the wound and over the glandular area, making use of as much cross-firing as possible.

The place for radium in the treatment of oral malignant disease is within the mouth, and not on the outside. Here it is used filtered through 0.5 mm. of silver. About 600 milligram-hours of radium are applied. The rationale of this inside use of radium is that it is another cross-firing effect in addition to that of deep radiotherapy.

Pfahler reports numerous cases of malignant disease involving the lip, tongue, cheek, and tonsil, in the treatment of which he was convinced of the superiority of the combined method over any single procedure.

[*Journal of Infectious Diseases*, Chicago, September 1916.]

Lesions in Rabbits Produced by Streptococci from Chronic Alveolar Abscess. By A. M. Moody.

The purpose of Moody's study is to "determine as far as possible what streptococcus viridans isolated from chronic alveolar abscesses would do when injected into the blood of young rabbits. The points to be considered were the following: (1) What is the relation of streptococus viridans in chronic alveolar abscess to systemic disease? (2) What properties of elective localization does this organism possess? (3) What kind of lesions follow injection of streptococcus viridans isolated from individuals who otherwise are in perfect health? (4) Do the lesions occurring in rabbits injected with this streptococcus warrant the conclusion that similar lesions are apt to follow the more gradual invasion of the human body with a like strain of the organism in question?"

Moody describes the technique followed in the collection of material, in the bacteriological examination, and in the method of injection.

There were 178 rabbits injected with pure strains of streptococcus viridans. In from 36 to 48 hours after injection the majority of the animals developed a stiffness, and remained rather inactive. Those in which no permanent lesions developed recovered shortly, and when killed disclosed no trace of the cause of the stiffness. Only 27 of the 178 rabbits died following the injection; the others were killed with chloroform. An analysis of the extensive tables and charts shows that "Streptococcus viridans may cause disease in various parts of the rabbit's body. The lesions produced by organisms from persons without systemic disease are identical in character with those produced by organisms from patients with systemic infections. The fact that the former do not produce lesions quite as frequently as the latter indicates a difference between the organisms only in degree of virulence. Whether the lesions produced in rabbits by streptococci from persons who aside from alveolar abscesses are in perfect health warrant the conclusion that these persons would develop similar conditions were the foci of infection not removed, is a question which cannot be satisfactorily answered. Many of them, at any rate, are well past middle life, and otherwise in good health. There is abundant evidence for and against the property of elective affinity on the part of streptococci. Therefore one must conclude that the localization of streptococcus viridans cannot be determined wholly by some property inherent in the organism itself."

[*The Lancet*, London, November 4, 1916.]

Dental Disease in Nursing Women: A Note on the Association Between Oral Sepsis and Deficient Lactation. By Harold Waller.

"The particular effect of dental disease referred to [in this article] is a general lowering of the health—a result which in child-bearing women manifests itself by a failure in their power of lactation." Before explaining the failure of the child to thrive on the basis of dental disease in the nursing mother, great care must be taken to exhaust all other explanations.

Waller attaches importance to the presence of oral sepsis in the mother in cases where the child manifests dissatisfaction with the breast-feed and vomiting of an intractable type, variable from day to day. At times the vomiting interrupts the feeding, at other times it follows shortly after its conclusion. Sleep may be interfered with. The vomiting tends to be frequent, copious, forcible. In such case the mother may be frail, unhealthy in appearance. The child may frequently be undersized, presenting a persistent blueness of the extremities. Upon examination the mother probably will reveal metastatic effects of oral sepsis, *e.g.* rheumatism, recurrent sore throat, headaches, bad taste in the mouth on wakening, neuralgia, stiff neck, swollen face, or "gumboils," indigestion, vomiting, loss of appetite, and a decline in weight and strength.

Examination of the oral cavity generally reveals conditions illuminating to the etiology of the above manifold symptoms. "The real importance of the question [of oral sepsis in nursing women] lies in the chance which treatment offers of effecting a sufficiently rapid improvement in a woman's health to raise her powers of lactation from a subnormal to a satisfactory level." Waller believes that adequate removal of the dental disease will permit a sufficiently rapid amelioration of the mother's general condition to avoid the necessity of artificial feeding of the child.

"Two changes should follow [oral] treatment if its effects on a woman's health is sufficient to influence lactation: (1) The rate of gain in the child's weight should be accelerated, and (2) the length of time over which nursing can be carried out should be prolonged."

Waller details three case histories which strikingly reveal the justice of his thesis. The children showed obvious signs that the mother's milk was unsatisfactory. The mother's oral condition was bad. Correction of this almost at once was followed by an improvement in the condition of the child. Waller for each case reproduces a chart, comparing the actual weight curves of the child with the normal (Budin's) weight curve. These are graphically convincing of the accuracy and importance of Waller's contention.

PERISCOPE

To Remove a Shell Crown Without Distortion.—It is occasionally necessary that a shell crown be removed. In order that this may be done with as little distortion as possible, a small hole is drilled through the buccal aspect of the crown on a level with the top of the root. Introduce a suitable sharp-pointed instrument through the hole, and gently lever off the crown. It is surprising how easily this can be done.—*Australian Journ. of Dentistry.*

Protecting the Gum Margins in Partial Dentures.—The clinical experience of all offers a convincing proof of the first and most important essential in designing a partial denture or any kind of artificial restoration of lost teeth. The necessity for keeping all clasps, bands, half bands, hoods, saddles, bars, etc., away from the free margin of the gum, and especially to avoid sinking them between the root and the free gum margin is imperative.—W. E. CUMMER, *Oral Health.*

Grinding the Cusp to Prevent the Lodgment of Food.—In some cases we shall find that fibrous food will wedge between teeth, even where the contact point is good. In these cases take a bite in modeling compound and pour a model. It will usually be found that the opposing cusp impinges in a sharp wedge shape, so as to spring the teeth apart at each occlusion. The remedy is to grind the sharp cusp to flatten it somewhat, which will usually bring instant relief.—EDITORIAL, *Dental Review.*

Ionization in Sterilizing Root-canals.—As an agent in sterilizing root-canals, there can be only one verdict—that ionization with zinc chlorid is the best method at our disposal. A fine platinum or steel broach, with cotton saturated in a five per cent. solution of $ZnCl_2$, and introduced into all canals before filling, will insure an absolutely aseptic canal filling. The zinc chlorid will penetrate the dentinal tubules, and any escaping through the apex will not irritate, but if anything, will stimulate and sterilize to perfection; in fact, the whole tooth structure could be saturated with zinc and no after-trouble ensue.—J. POLACK, *Australian Dental Journal.*

Non-Corrosive Iodin-Carrier.—A very useful broach or carrier of iodin preparations is made by taking a strip of ordinary aluminum plate about two inches long, cutting it into strips a little wider at one end than its thickness, tapering it to a blunt point at the other end, rounding the edges by filing, and inserting the large end into a broach-holder or split stick. Wrapped with a little cotton, or plain, it makes a splendid instrument for carrying iodin preparations into pyorrhea pockets. Being flexible, it can be easily bent into the best possible shape to reach any pocket. Wrapped with a larger quantity of cotton it makes a splendid swab. The iodin will not corrode the aluminum.—P. A. PYPER, *Dental Review.*

Effect of Diet on Children's Teeth.—There is no doubt that infant-feeding must affect the teeth as well as the other structures of the body. Indeed, to go farther back than that, the antenatal care of children that is now so strongly advocated is a move in the right direction, and will doubtless have a beneficial influence upon the teeth. The deciduous teeth are developing during the intrauterine life of the child, and it is highly probable that the health of the mother has more effect upon their development than the diet of infancy has upon the development of the permanent teeth—and one of the best safeguards of the permanent dentition is a sound first dentition.—T. E. CONSTANT, *Brit. Journ. of Dental Science.*

Silicate Cement.—Another use for this excellent material is in the construction of shell crowns for the upper bicuspids. My technique is as follows: After constructing the band and getting the wax cusp, remove from the tooth, lift the wax off the band, and cut out the labial portion of the band to, say, within one-eighth of an inch of the gingivæ; then replace the wax cusp, cast, and cement on the tooth, after which insert the synthetic filling. By this method can be made a crown possessing all the good points of a shell crown with very little display of gold. In my opinion a crown constructed in this manner is superior to either the open-face crown or the bicuspid Richmond crown.—A. N. KEARBY, *Texas Dental Journal.*

Rationale of Clasp Action.—While the rebound or spring of the clasp against the tooth in setting up a friction is an important factor in clasp action, and all-important in the case of the more unfavorable type of tooth, namely, one with parallel sides, yet the most effective clasps, which go into position with that "snap" so grateful to the patient, are those which mechanically conform to the slight "bell" shape of the crown of that type of tooth peculiarly well fitted for clasp action. It may thus be noted that in order to attach or remove a formed band clasp from such a tooth, its free ends must be sprung apart to a distance proportional with the bell shape of the tooth, thus insuring a mechanical locking of the clasp in position.—W. E. Cummer, *Oral Health.*

Bismuth Paste for Filling Root-canals.—The formula for the paste is as follows: Bismuth subnitrate, 30 parts; yellow vaselin, 60 parts; white wax, 5 parts; paraffin, 5 parts. It may be used to fill (1) roots with large apical openings from absorption or lack of development, (2) deciduous teeth, (3) punctured roots, and (4) bifurcated openings. The technique of insertion is as follows: Place the jar of paste in a hot water-bath, and when the mass becomes liquefied carry some to the tooth with a syringe. The nozzle of the syringe must be warm, and large enough to take up and discharge the paste. It may be necessary to pack unvulcanized rubber around the nozzle to force the paste into the canal or to use the rubber as a piston as in pressure anesthesia. A gutta-percha cone may now be gently passed into the canal. —*Dominion Dental Journal.*

To Relieve Pain in Incipient Alveolar Abscess or in Neuralgia.—Sometimes the pain is vague along one side of the jaw and not easily located. If it is found impossible to decide on any one tooth as the seat of the trouble, the pain may frequently be relieved by taking some menthol crystals, about the quantity that would lie on a dime, and placing them in half a teaspoonful of water and holding the spoon over the gas till the crystals are melted down in the liquid. Dip a piece of cotton in the melted menthol and pack this between the cheek and gum on the affected side. The menthol will soothe the pain, and frequently relieve it entirely. This is also an excellent remedy for clearing out the head and facilitating breathing where the nasal passages are stopped up with a cold. In this case pack the saturated cotton under the upper lip. It will be found a great relief.—Editorial, *Dental Review.*

Soldering Teeth.—Care should be taken that the backing fits closely to the tooth. The pins should be bent—not riveted—on to the backing. Be careful that the holes are punched so that they do not have to be made larger than just to allow the pins to go through easily, so that in soldering, the tooth is not exposed to the blowpipe any more than is absolutely necessary. Be sure that all grease and paint are cleared from the plate. Use borax of the consistence of cream, and be sure that it is clean, and that there is not too much of it. Take care that the soldering is done as quickly as possible when the solder is brought to the melting-point. If the foot-blower is used, be careful that not too great a heat is employed, as that is one of the reasons for teeth dropping off sometimes; but until we reach perfection that will happen occasionally, as no maker of teeth can guarantee that every platinum pin shall be perfect.—W. Jones, *Ash's Monthly.*

Glycerite of Starch in the Treatment of Pyorrhea.—In the local treatment of pyorrhea we have in glycerite of starch a valuable agent. Smeared freely around the necks of the teeth and carefully worked into the gum pockets, and left in contact for some minutes, it softens and loosens tartar and facilitates its removal.

Medicated pastes for injection into the pockets, consisting of sodium chlorid 15 per cent., or bismuth carbonate 30 per cent., or zinc oxid in a like proportion, are markedly helpful in pyorrhea treatment. In more advanced cases and where there is much pus, the addition of a few drops of guaiacol to either of the foregoing adds to their remedial value.

Pastes made with a greasy basis are wellnigh useless in pyorrhea treatment because of the moistness of the tissues. They melt by the warmth of the mouth, and simply coat the tissues with a greasy film until washed away by the oral fluids. Glycerite of starch, on the other hand, is readily absorbed by either moist or dry tissues.

It makes a good lubricant for gum massage, and when directing patients to practice auto-massage it is well to prescribe a supply for the purpose. It may be used alone or in combination with a suitable drug, sodium chlorid, for instance. The following makes a good massage paste:

℞ Sodii chloridi,	gr. xx
Ess. limonis,	gtt. v
Glyc. amyli,	℥ss. M.

Sig.—Massage paste for gums. To be used as directed. —J. T. Hall, *Brit. Dental Jnl.*

OBITUARY

Dr. Rudolph H. Hofheinz.

[SEE FRONTISPIECE.]

DIED, at Rochester, N. Y., November 23, 1916, from valvular affection of the heart, RUDOLPH H. HOFHEINZ, D.D.S., at the age of sixty years.

Dr. Hofheinz, one of Rochester's best known dentists, died at his home, 444 Oxford st. He had been a sufferer from a valvular affection of the heart for many years, but had been able until the day previous to his death to attend to his practice.

Born in Heidelberg, Germany, in 1856, Dr. Hofheinz came to the United States in 1871, and settled immediately in Rochester. He studied for the dental profession in the New York College of Dentistry in New York City from 1876 until February 25, 1879, at which date he was graduated with the highest honors awarded to any member of his class.

Dr. Hofheinz returned to Rochester after his graduation and opened an office in that city. He soon became an expert practitioner and also a valued contributor to dental literature. In 1892 the Council of the University of Buffalo organized a dental school in connection with that institution, and early in 1896 Dr. Hofheinz became connected with its teaching force as assistant to Dr. Franklin E. Howard, the then professor of operative dentistry. Before the opening of the term 1897–98 Professor Howard was, at his own request, given an emeritus position, and Dr. Hofheinz was elected professor of operative dentistry in his place. In 1909 Dr. Hofheinz felt impelled to relinquish the active duties connected with his professorship, and was given an emeritus position on the faculty, and this he retained until his death. For the last seven years he had directed his attention only to the practice of his profession in Rochester and the making of further contributions to dental literature.

As an authority on operative dentistry and kindred subjects, Dr. Hofheinz was prominent among the dentists of the country. He was the author of many pamphlets and essays, many of which today are used as text matter in dental colleges.

He was from the first active in dental society affairs, and always took a prominent part in various dental activities. Dr. Hofheinz had been president of the Seventh District, the New York State Dental Society, and the Rochester Dental Society, also a member of the committee of organization of the Fourth International Dental Congress, filling his various positions with signal honor to himself and to the great satisfaction of those whom he served. He took an active part in the organization of the Rochester Dental Dispensary, and at the time of his death was a director and vice-president. On October 24th he was appointed principal of the School for Dental Hygienists of the Rochester Dental Dispensary, to which he had expected to devote much of his time, energy, and ability. Seven or eight years ago Dr. Hofheinz was offered the presidency of the National Dental Association, but was persuaded to decline the position by his family and consulting physicians, who feared that overwork might aggravate his heart affection.

Dr. Hofheinz, always a student, was one of the most highly educated men in dentistry. He was a frequent contributor to the literature of the profession, an essayist of distinction, and a discusser of papers of pleasing and rare ability. Few men have occupied so large a place in dental affairs as did he. He enjoyed a wide acquaintance among the older men in dentistry. To the younger men and those just entering the profession he was most considerate and helpful, and there are many who owe much of their success to his kindly advice and assistance. He had a genial disposition, and was the friend of everyone. He was a true and devoted friend, and was loved most where he was known best. His death is a distinct loss not only to the profession which he served so long and so devotedly, but to a wide circle of friends who loved him for his many fine qualities of mind and heart.

Dr. Hofheinz was a member of the Genesee Valley, Rochester, and Country clubs.

The funeral took place from his home on November 25th.

Dr. Hofheinz is survived only by his devoted wife, to whom he was married in 1884.

H. J. B.

DENTAL LEGISLATION

The Naval Dental Corps.

PROVISIONS RELATING TO NAVAL DENTAL SERVICE, AS INCORPORATED IN THE NAVAL APPROPRIATION ACT [H. R. 15,947]—APPROVED AUGUST 29, 1916.

NAVAL DENTAL CORPS.

The President of the United States is hereby authorized to appoint and commission, by and with the advice and consent of the Senate, dental surgeons in the Navy at the rate of one for each one thousand of the authorized enlisted strength of the Navy and Marine Corps, who shall constitute the Naval Dental Corps, and shall be a part of the Medical Department of the Navy. Original appointments to the Naval Dental Corps shall be probationary for a period of two years and may be revoked at any time during the probationary period by the President: *Provided,* That the rank of such officers of the same date of appointment among themselves at the end of said probationary period shall be determined by the recommendations of an examining board appointed by the Secretary of the Navy, which board shall conduct a competitive examination, based upon both service record and professional attainments, in accordance with such regulations as may be prescribed by the Secretary of the Navy, and the rank of such officers so determined shall be as of date of original appointment with reference to other appointments to the naval service: *Provided further,* That all appointees to the grade of dental surgeon shall be citizens of the United States between twenty-four and thirty years of age, and shall be graduates of standard medical or dental colleges and trained in the several branches of dentistry, and who shall, before appointment, have successfully passed moral, physical, and professional examinations before medical and professional examining boards appointed by the Secretary of the Navy, and have been recommended for appointment by such boards.

Dental surgeons shall have the rank, pay, and allowances of lieutenants (junior grade) until they shall have completed five years' service. Dental surgeons of more than five but less than twenty years' service shall, subject to such examinations as the Secretary of the Navy may prescribe, have the rank, pay, and allowances of lieutenant. Dental surgeons of more than twenty years' service shall, subject to such examinations as the Secretary of the Navy may prescribe, have the rank, pay, and allowances of lieutenant commander: *Provided,* That the total number of dental surgeons with the rank, pay, and allowances of lieutenant commander shall not at any time exceed ten.

All officers now in the Dental Corps (including the officers appointed for temporary service) appointed under the provisions of the Act of August twenty-second, nineteen hundred and twelve, entitled "An Act making appropriations for the Naval Service for the fiscal year ending June thirtieth, nineteen hundred and thirteen, and for other purposes," and all officers now in active service appointed under the provisions of the Act of March fourth, nineteen hundred and thirteen, who were eligible for appointment to the Dental Corps under the provisions of said Act, shall be appointed dental surgeons in the Dental Corps without further examinations and without regard to the age qualifications herein prescribed: *Provided*, That the officers so appointed shall not be subject to the provisions herein prescribed for probationary service for a period of two years: *Provided further*, That such officers shall, after appointment as herein prescribed, rank from date of commission and take seniority among themselves in the order of their original appointment by the Secretary of the Navy as shown on the Navy list on the date of approval of this Act; *And provided further*, That no dental surgeon appointed in accordance with the provisions of this Act who on original appointment to the Dental Corps was over forty years of age shall be eligible for retirement before he has reached the age of seventy years, except for physical disability incurred in the line of duty.

Dental surgeons who shall have lost numbers on the Navy list by sentence of court-martial or by failure upon examination for promotion shall be considered to have lost service accordingly for purposes of advancement in rank with increased pay and allowances.

Approved August 29, 1916.

SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS not later than the 11th or 12th of the month preceding that of publication.

Chicago Dental Society.

ANNUAL CLINIC.

THE annual clinic of the Chicago Dental Society will be held at the Hotel La Salle, January 26 and 27, 1917.

Extensive preparations are being made to make this one of the best clinics ever held by the society.

Papers of the highest type, clinics demonstrating the very latest and best in modern dentistry, exhibits of the newest appliances by firms from all over the United States, and a banquet that will be a pleasure long to be remembered, are but a part of the features of this great meeting.

Dr. Joseph Bloodgood of Baltimore will present the paper at the meeting on Friday evening, and at the banquet on Saturday evening Dr. Vincent of Minneapolis will be the first speaker, after which the meeting will take the form of a testimonial to Dr. Edmund Noyes.

Headquarters, Hotel La Salle.

GEORGE C. POUNDSTONE, *President*,
PERCY B. D. IDLER, *Sec'y*,
30 N. Michigan ave., Chicago.

The Chayes Dental Club.

ON June 15, 1916, the Chayes Dental Club held its first meeting at the Hotel McAlpin, New York. It is composed of forty dentists who have adopted the Chayes system of movable-removable bridge work in their practices and have banded together for study and mutual help and to further propagate the idea among their fellow practitioners.

It is proposed at subsequent meetings to hold open discussion on the all-important subject of bridge work, and to conduct clinics demonstrating the beneficial effect of Chayes bridge work in the human mouth.

The society invites correspondence with dentists in New York and other cities who are doing this work or are interested in it.

PHILIP HUSSA, *President*,
8 West 40th st., New York.
J. O. LIEF, *Sec'y*,
320 Fifth ave., New York.

SPECIAL NOTICE.

Banquet and Presentation to Mr. Thomas A. Forsyth, at Boston, January 20, 1917.

LOVING-CUP TO BE PRESENTED.

Gentlemen of the Dental Profession:

You are cordially invited to participate in the presentation by the dental profession of a loving-cup to Mr. Thomas Alexander Forsyth at a banquet on Saturday, January 20, 1917, at half after six o'clock, at the Hotel Somerset, Boston.

Tickets for this banquet (subscription $5.00) can be obtained from any member of the committee. Checks should be made payable to Dr. Charles J. Smith, 35 Butler Exchange, Providence, R. I.

Frederick A. Keyes, D.M.D.,
Chairman.
Percy R. Howe, D.M.D.,
F. S. Belyea, D.M.D.,
Banquet Committee on Publicity.

American Institute of Dental Teachers.

ALL DENTAL TEACHERS WELCOME.

THE next annual meeting of the American Institute of Dental Teachers will be held at Hotel Adelphia, Philadelphia, Pa., January 23, 24, and 25, 1917.

A number of papers, reports, and discussions relating specially to dental education will mark this meeting. All dental teachers are cordially invited to be present.

ABRAM HOFFMAN, *Sec'y*,
529 Franklin st., Buffalo, N. Y.

Tennessee State Dental Association.

THE forty-ninth annual meeting of the Tennessee Dental Association was held at Knoxville, June 20 to 22, 1916. This was one of the best meetings in years. The place of meeting was ideal, and the attendance was far beyond our expectations.

The association had the honor of having W. H. O. McGehee and J. R. Callahan of Cincinnati, Ohio, and Dr. F. W. Rounds, president of the Louisville Dental Society, Louisville, Ky.

The officers elected for the 1917 meeting—which is "golden-jubilee" year—are as follows: D. M. Cattell, president; C. O. Rhea, first vice-president; Stanley Rich, second vice-president; C. E. Hines, recording secretary; Jas. W. Winn, treasurer; Frank W. Wiggins, corresponding secretary.

H. C. MAXEY.

Dental Society of the State of New York.

THE forty-ninth annual meeting of the Dental Society of the State of New York will be held in Convention Hall, Rochester, N. Y., May 10, 11, and 12, 1917, including the literary program, clinics, and exhibits.

Note that the dedication of the Rochester Dental Dispensary—the gift of Mr. George Eastman to the city of Rochester—will take place on Wednesday, May 9th, and the profession is cordially invited.

This the forty-ninth will be our banner gathering, because of the favorable location and the well-known ability of the Rochester dentists to stage a successful meeting. All ethical dentists are cordially and fraternally invited. The Executive Council will meet in Buffalo on the afternoon of May 9th, organize, and then adjourn, to meet in Rochester the following day.

Exhibitors are cordially invited. For space and rates address Dr. E. G. Link, Cutler Bldg., Rochester, N. Y.

For programs and general information address

A. P. BURKHART, *Sec'y*,
52 Genesee st., Auburn, N. Y.

Virginia State Dental Association.

THE Virginia State Dental Association will meet in Norfolk, April 17, 18, and 19, 1917. All members of the National Dental Association or any state society are cordially invited to attend.

C. B. GIFFORD, *Corresponding Sec'y*,
Norfolk, Va.

Florida Board of Examiners.

THE next meeting of the Florida Board of Dental Examiners will be held at Jacksonville, Fla., January 4, 5, and 6, 1917.

R. P. TAYLOR, *Sec'y*,
Jacksonville, Fla.

Minnesota State Dental Association.

THE thirty-fourth annual convention of the Minnesota State Dental Association will be held February 23 and 24, 1917, at the University of Minnesota, Minneapolis, Minn.

MAX E. ERNST, *Sec'y*,
51 Loury Bldg., St. Paul, Minn.

Arkansas Board of Examiners.

THE Arkansas State Board of Dental Examiners will hold a special examination at the Marion Hotel, Little Rock, Ark., January 4, 5, and 6, 1917.

The application and fee should be filed at once, so that arrangements may be made for all who wish to take the examination. For further information, address

I. M. STERNBERG, *Sec'y*,
Fort Smith, Ark.

Montana Board of Examiners.

The Montana State Board of Dental Examiners will meet at Helena, Mont., for examinations, January 8, 9, 10, 11, and 12, 1917.

G. A. Chevigny, *Sec'y,*
Butte, Mont.

North Dakota Board of Examiners.

The North Dakota State Board of Dental Examiners will hold their next meeting in Fargo, beginning Tuesday morning, January 9, 1917. All applications must be in the hands of the secretary at least ten days before the examination.

For further information and application blanks, write

W. E. Hocking, *Sec'y,*
Devils Lake, N. D.

South Dakota Board of Examiners.

The South Dakota State Board of Dental Examiners will hold its next meeting in Sioux Falls, S. D., January 9, 1917, beginning at 9 a.m., and will continnue three days. All applications must be in the hands of the secretary January 2d. For further information address

Rob't Jasmann, *Sec'y,*
Scotland, S. D.

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UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING NOVEMBER 1916

November 7.

No. 1,203,572, to Charles F. Betts. Dental chair.

No. 1,203,636, to Isidore Louis. Rotary tooth-brush.

No. 1,204,113, to Edward H. Angle. Orthodontic appliance.

No. 1,204,114, to Edward H. Angle. Orthodontic appliance.

No. 1,204,166, to Samuel A. Levin. Apparatus for making artificial tooth-crowns.

November 14.

No. 1,204,609, to Samuel G. Supplee and Charles J. Engstrom. Dental rubber compositicn and art of manufacture.

No. 1,204,762, to Oliver Claude Haney. Rotary tooth-brush.

No. 1,204,800, to Wm. T. Lyon. Handpiece for dental machines.

No. 1,205,088, to John F. Fietsch. Device for measuring materials for tooth-fillings.

November 21.

No. 1,205,156, to Wm. E. Butler. Electrical dental engine.

No. 1,205,311, to Francis M. A. and Lena Wybailie. Sanitary tooth-brush holder.

No. 1,205,437, to Frank A. Delabarre. Adjustable dental model.

No. 1,205,553, to Wm. T. Lyon. Handpiece for dental machines.

No. 1,205,732, to Richard Groetchen. Dental thread holder.

No. 1,205,922, to Simon Myerson. Artificial tooth.

November 28.

No. 1,205,957, to Julius Albrecht. Preparation for treating teeth.

No. 1,206,045, to Arthur E. Smith. Nasal inhaler.

No. 1.206.321, to Charles Hammesfahr. Tooth-brush holder.

No. 1,206,478, to Lake H. Sprinkle. Apparatus for making plates for artificial teeth.

DR. GORDON WHITE.

THE

DENTAL COSMOS

VOL. LIX. FEBRUARY 1917. No. 2.

ORIGINAL COMMUNICATIONS

A Study of the Minute Structure of Dentin, Especially of the Relation Between the Dentinal Tubules and Fibrils.

By Dr. KANAE HANAZAWA, Tokyo, Japan,

PROFESSOR OF HISTOLOGY AND PATHOLOGY IN THE TOKYO DENTAL COLLEGE.

(I.)

I. Introduction.

SINCE E. Neumann published the report of the results of his researches on dentin ("Beitrag zur Kenntnis des normalen Zahn- und Knochengewebes," 1863) his theory appears to have been generally accepted, and we find that most of the text-books of the present day contain the theory evolved from his labors. There are, however, some investigators who have decidedly different views upon the subject; thus, Römer and O. Walkhoff are representative opponents of Neumann's theory.

I shall present, first, in this study, the various views of my predecessors reviewing the literature, and examine the differences between those histologists; next I shall present a brief view of the present status of the main points of discussion among scientists; and finally, conclude with the expression of my own opinion.

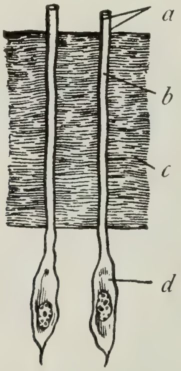
In the year 1914 I engaged in the study of this subject under the guidance of Römer, in the Kaiser Wilhelm University, Strassburg, Germany. At that time I had the opportunity of hearing his opinions and viewing his preparations for myself. But the breaking-out of the war compelled me to abandon my researches before satisfactory results were attained for the solution of the several problems. Furthermore, I was compelled to leave Germany so hurriedly that I left behind many important preparations, and returned home without any fruitful results in shape for publication. This paper is the report of my research as resumed after returning to Tokyo late in the autumn of 1914.

II. Literature.

With reference to the structure of dentin, Leeuwenhoek seems to have been the first to deal with this subject. In 1722 he noted the existence of numberless small tubular substances in examining a thin section of human dentin under the microscope. This observation, however, was not considered seriously by investigators generally until a considerable time thereafter.

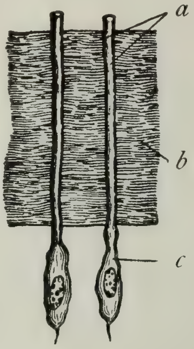
The existence of dentinal tubules, however, was observed by Fränkel (1835), Müller (1836), and Retzius and Purkinje (1837). All these investigators observed not only the tubular structure in transverse sections of dentin, but also the fact that they are provided with special circular layers, which are comparatively thick, yellow, and more or less dark, which were subsequently called tubular sheaths, although it is not certain they are the same substances as what we call dentinal sheaths today. The phenomenon of the dentinal tubule looking white by reflected light and presenting a dark tint by transmitted light is considered to be caused by deposit of calcium salts which is probably a similar condition to that of the canaliculi of bone given off from the outside of the bone lacunæ. Along with this view, Müller explained that the dentinal tubule possesses a decalcified wall, and Linderel, who studied with Müller, described it (1837) as a fiber which had been calcified. On the other hand, Schwann, Gerber, Wedl, and Hertz considered the contents of dentinal tubules to be liquid, while Tomes, Lessing (1848), and Todd-Bowmann were of the opposite view to that expressed by Linderel. In 1852 Kölliker discovered the fact that the dentinal tubules could be satisfactorily isolated by treating the dentin with concentrated acid or alkali, but he mistook them for the processes of the odontoblasts, which are tubules full of liquid and embodied in the basis substance. (Fig. 1.) In the year 1856, Tomes, by decalcifying the sections of newly extracted teeth in hydrochloric acid and then breaking them, observed at the broken edges soft fibrillar substances which he considered as the contents of the dentinal tubules, and as having passed into the dentinal tubules from the pulp. (Fig. 3.) But Tomes did not touch the questions of whether or not the chemically isolated substances were dentinal sheaths, and whether it, the substance, was the same as the dentinal fibrils which he had demonstrated before. Kölliker, after further study, reached the same opinion as Tomes, regarding the isolated substances he had produced as the contents of dentinal tubules, and came to the conclusion that the dentinal tubules did not possess isolatable walls, but con-

Fig. 1.



Scheme after the earlier opinion of Kölliker. *a*, Process of the odontoblast, or the dentinal tubule which contains a fluid inside. *b*, The interstice in the dentinal tubule. *c*, Basis substance. *d*, Odontoblast.

Fig. 2.



Scheme after the later opinion of Kölliker. *a*, Process of the odontoblast, or the solid dentinal fibril. *b*, Basis substance. *c*, Odontoblast.

sidered the dentinal tubules to be simple interstices between certain structural tissues, and the dentinal fibrils to be substances which penetrated them. (Fig. 2.) The dentinal fibril, or the process of the odontoblast known as Tomes' fibril, is said to have been first described by Waldeyer.

In 1863 Neumann studied the substance which Tomes considered to be the process of the odontoblast by means of mechanical isolation, and concluded that it was not solid fiber at all, but only a tubular substance or a dentinal tubule. From this viewpoint Kölliker's first observation was correct; but his conclusion, which concurs with that of Tomes—namely, that it is a solid dentinal fiber—is incorrect. In other words, the substances observed by Tomes and isolated chemically by Kölliker are the dentinal tubules (Fig. 4), and that which was isolated by Tomes was not the real dentinal fibril, but the dentinal tubule. These opinions were also shared by such histologists as Waldeyer, Römer, and Fleischmann. Briefly, Neumann's opinion may be summed up as follows:

(1) The dentinal tubules possess definite walls which may be isolated by either chemical or mechanical means.

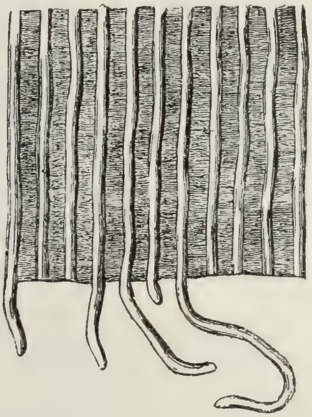
(2) The dentinal tubule contains an uncalcified solid fibril, or a dentinal fibril, which is a process of the odontoblast.

(3) The wall of the dentinal tubule is not the calcified product of the combination between the membrane of the dentinal fibril and the basis substance, but is a part of the dense calcified ground substance. Though this wall is connected immediately with the basis substance, they can be differentiated by their individual resistance to chemical reagents.

With this view, Neumann first described the walls of the dentinal tubules by the name of "sheaths"—Neumann's sheaths, as they are now known.

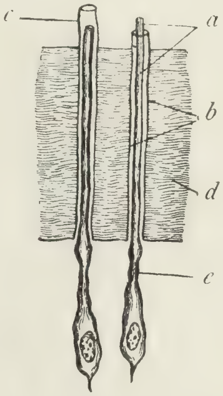
Neumann's opinion was recognized at the time as a likely hypothesis as to the relation between the dentinal tubule and the dentinal fibril, while since then most investigators have regarded his theory as the established truth when treating of the problems of the structure of the dentin.

FIG. 3.



Section (after Tomes) of the crown of an adult tooth, cut longitudinally parallel to the direction of the dentinal tubule, and broken perpendicularly to the dentinal tubule after decalcification. The dentinal fibril detached and projecting from the fractured edge of the dentin. ("System of Dental Surgery," by John Tomes, 1859, p. 328.)

FIG. 4.



Scheme after Neumann's opinion. *a,* Process of the odontoblast, or solid dentinal fibril. *b,* Dentinal sheath or Neumann's sheath. *c,* Dentinal tubule isolatable mechanically or chemically. *d,* Basis substance. *e,* Odontoblast.

RÖMER'S OPINIONS.

In 1899, however, Römer expressed his opinion ("Zahnhistologische Studie: Die Köllikerschen Zahnbeinröhrchen und Tomeschen Fasern") thus:

Dentinal fibrils are processes of the odontoblasts and possess tubular structure in which a semifluid substance circulates. He concluded that—

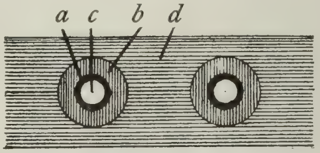
(1) Tomes' fibrils, which have been considered by Kölliker as the contents of the dentinal tubules, and so accepted generally, are not such in reality, but are the combination of the contents and walls (or Neumann's sheaths). In other words, Tomes' fibrils and Kölliker's dentinal tubules are one and the same thing.

(2) The processes of the odontoblasts constitute the walls of the dentinal tubules (or Neumann's sheaths) from the point where the former are about to enter the dentin; the walls developing into the elastic cell membrane of the odontoblasts in their next course.

Römer's opinions are expressed very clearly in his work issued in 1909, "Text zum Atlas der Pathologisch-anatomischen Veränderungen der Zahnpulpa nebst Beiträgen zur normalen Anatomie von Zahnbein und Pulpa beim Menschen," from which the following description is quoted:

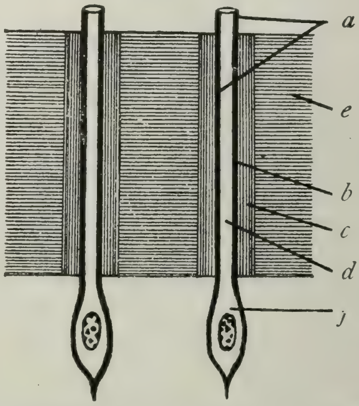
> The odontoblasts give off tubular processes into the basis substance of the dentin and penetrate the entire layers up to the border of the enamel from the inner surface of the pulp. These processes are termed generally Tomes' fibrils, and they have considerably resistant and elastic walls, so that they can be isolated comparatively easily from the basis substance of dentin by the action of strong acids. When the extracted teeth are hardened and the pulps extracted carefully from their cavities, the processes of the odontoblasts can be readily drawn out from the basis substance of the dentin. Or, if the ground-down sections lying between the cover-glass and the object-glass are subjected to the action of dilute acids, the processes of the odontoblasts can be readily isolated for examination under the microscope. These fine fibrillar processes of the odontoblasts are not solid fibrils, but tubular substances, and form the so-called dentinal tubules. In other words, the processes are the same as the dentinal tubules. These tubular processes or dentinal tubules are surrounded with somewhat thick circular layers, which belong to the basis substance of the dentin; they differ from the ordinary ground substance in that they are less calcified. The state of calcification may be perhaps compared with the dentinogenic zone. These circular layers have little affinity for hematoxylin. As the tubular processes of the odontoblasts or the dentinal tubules combine with these layers quite loosely, they are comparatively easily sepa-

FIG. 5.



Scheme (transverse section) after Römer's opinion. *a*, Dentinal fibril or dentinal tubule; tubular process of the odontoblast, which possesses an elastic and resistant wall, and is isolatable. *b*, Circular layer or slightly calcified ground substance; the so-called dentinal sheath, after Römer's nomenclature. *c*, Tubular interstice which admits a semi-fluid. *d*, Basis substance.

FIG. 6.



Scheme (longitudinal section) after Römer's opinion. *a*, Dentinal fibril or the dentinal tubule, isolatable. *b*, Wall of the dentinal tubule, or a substance developed from the membrane of the odontoblast. *c*, Dentinal sheath after Römer's nomenclature. *d*, Tubular interstice which admits a semi-fluid. *e*, Basis substance. *f*, Odontoblast.

rated, and so the former can be readily extracted, as a saber blade would be drawn out of its sheath. For this reason, I call these circular layers the sheaths of the dentinal tubules, but it must be remembered that these sheaths are not absolutely the same as Neumann's sheaths, as the dentinal sheaths which I named are not so resistant to chemical action as Neumann's sheaths. [See Figs. 5 and 6.]

In short, Römer is of the opinion that both the fibrillar substance which can be isolated by acids or alkalis (*i.e.* Neumann's dentinal sheaths), and the fibrillar substance which can be extracted mechanically, are nothing but the processes of the odontoblasts (dentinal fibrils or Tomes' fibrils) ; they are not solid, but tubular, and contain fluid or semi-fluid. These tubular processes or dentinal tubules are surrounded by circular layers or "dentinal sheaths"—that is, the dentinogenic zone.

In 1905, Fasoli of Bologna published a similar opinion to that of Römer, in "Su la Struttura histologica della Dentina."

FLEISCHMANN'S OPINIONS.

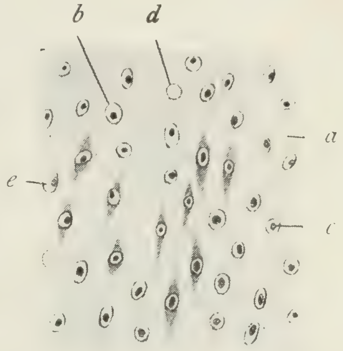
Fleischmann in 1905—"Ueber Bau und Inhalt der Dentinkanälchen," *Archiv für mikrosk. Anatomie u. Entwicklungsgeschichte,* Bd. 66—concurred with Neumann, expressing the opinion that

> The dentinal tubules are the canaliculi which permeate the basis substance of the dentin, the walls of which are composed of peculiar sheaths belonging to the ground substance, or the so-called Neumann's sheaths. They are strongly resistant to acids and alkalis, and therefore can be easily isolated. There are contained solid fibrils which are the processes of the odontoblasts, the dentinal fibrils, or Tomes' fibrils, in the dentinal tubules.

Fleischmann published the same opinion again in 1910 in "Ergebnisse der gesamten Zahnheilkunde," H. 1. He says:

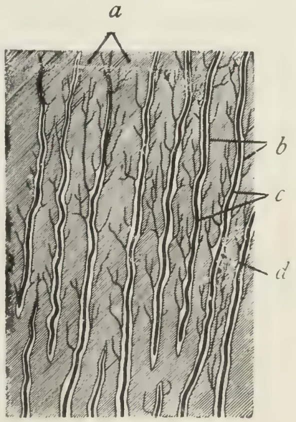
> We can see a circular substance which seems to be the border of the dentinal tubule, in the transverse decalcified and stained sections (he employed Delafield's hematoxylin). This makes quite a distinct border between the dentinal tubules and the basis substance, and it is stained strongly with hematoxylin. Inside this circular substance there is a very small disk, which is as distinctly stained as the former with hematoxylin. This disk lies in the center of or immediately attached to

FIG. 7.



Transverse section (after Fleischmann) through the root of an incisor, hematoxylin and eosin staining. Magn. 1000 diam. *a*, Basis substance. *b*, Dentinal sheath. *c*, Dentinal fibril. *d*, Hollow dentinal tubule from which the dentinal fibril has fallen. *e*, Interstice between dentinal fibril and dentinal sheath.

FIG. 8.



Longitudinal section (after Fleischmann) through the root of a molar, hematoxylin and eosin staining. Magn. 1000 diam. *a*, Basis substance. *b*, Dentinal sheaths. *c*, Dentinal fibrils. *d*, Interstice between dentinal fibril and sheath.

the circular substance. Besides, we find some circular substance, even in the same section, which does not contain any disks at all. It is my belief that this circular substance is a dentinal tubule or Neumann's sheath, the disks being the processes of the odontoblasts or the transverse surfaces of the dentinal fibrils. The space between the circular substance (or sheath) and the disk (or dentinal fibril) is an interspace; it contains nothing. This interspace is a resultant product due to the contraction of the dentinal fibril by the action of the reagents while the sections are being prepared. [See Figs. 7 and 8.]

KANTROWICZ' OPINIONS.

In 1911, Kantrowicz published his opinion—which concurs with those of Neumann and Fleischmann—in "Bakteriologische und histologische Studie über die Karies des Dentins," as follows:

(1) The dentinal tubules possess borders, or the so-called Neumann sheaths, which are easily stained at the point close to the basis substance of the dentin.

(2) This sheath is of the same size as that of the fibrillar substance, which is isolatable in a solution of potassium hydroxid.

(3) The intervening portion between the basis substance of the dentin and the process of the odontoblasts which was demonstrated by Römer is not a slightly calcified substance, as this part is not stained with eosin, and besides, no histological structure is recognized in it. Furthermore, the fact that we cannot differentiate between this layer and the interspace which is due to the absence of the process of the odontoblast or the dentinal fibril, plainly proves that this is an interspace.

(4) Even in a tooth which has a putrescent pulp or which has been placed for a long time in acid, we can actually demonstrate vividly the existence of the sheath. In these teeth the odontoblasts and processes must have been lost long before the examination.

(5) Though we can observe the dentinal sheaths, the Tomes fibrils are lacking very often, which convinces us that these are two quite different substances.

WALKHOFF'S OPINIONS.

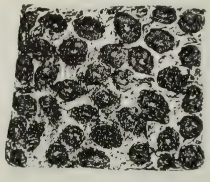
In 1899, Walkhoff published his opinion in the "Das sensible Dentin und seine Behandlung," and in 1901, in "Die normale Histologie menschlicher Zähne," as follows:

(1) The processes of the odontoblasts form the so-called dentinal fibrils, penetrating the basis substance of the dentin. These fibrils vary in size according to the person's age; in other words, they are large in young persons and become smaller as age advances.

(2) There are fairly thick, transparent layers on the outer side of the dentinal fibrils or processes of the odontoblasts, which he thinks are dentinal sheaths, and which can be stained crimson by Rupprecht's method of the fuchsin staining (in the ground-down section) (Fig. 9).

(3) The dentinal sheath possesses further a bordering layer along the basis substance which is situated around the sheaths. This bordering layer should be stained with hematoxylin when the sections have been decalcified.

FIG. 9.



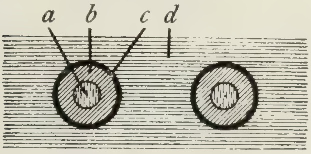
Dentinal sheath (after Walkhoff) stained by fuchsin after Rupprecht's method. ("Die normale Histologie menschlicher Zähne.")

In 1914, he repeats this opinion in the "Ueber den feineren Bau der Dentinkanälchen," in *Vierteljahrsschrift für Zahnheilkunde*, H. 1, 1914, at which time he said:

The part which Fleischmann, Kantrowicz, and other histologists believed to be the dentinal sheaths is in reality nothing but the bordering layer between the basis substance and that which I call the dentinal sheath, but which Fleischmann and Kantrowicz had considered to be interstices caused by the contraction of the dentinal fibrils. This bordering layer is the transition of the dentinal sheath (according to the writer) into the basis substance, and is easily destroyed by strong acid the same as the basis substance. Such destructibility of the layer permits the isolation of the dentinal sheath. The dentinal sheath, the wall of which is about 1.5

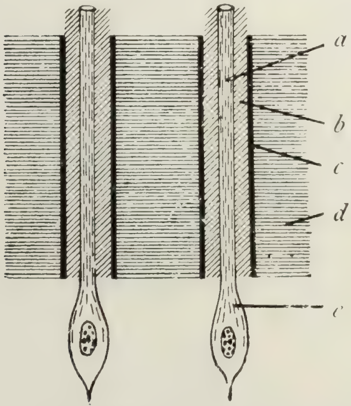
microns in thickness, presents a tubular appearance and forms the so-called dentinal tubule. It can be differentiated from the bordering layer or basis substance by chemical reagents, as well as easily distinguished from the contents (or dentinal fibril), the bordering layer, and the basis substance by staining methods and by its obstinate resistance to strong acids. This peculiar dentinal sheath is a product of the dentinal fibril. The dentinal fibril is of such a nature that it is readily destroyed by simple dryness and strong chemical reagents. On isolating the dentinal tubule in strong acid, the dentinal fibril, the process of protoplasm, or the contents of the tubule, would be rapidly destroyed; and the destruction and disappearance of the dentinal fibril will bring out an interstice, which would disappear owing to the peculiar elasticity or contraction of the dentinal sheath (the writer's dentinal sheath). In other words, the dentinal tubule maintains the wall in its ordinary thickness, but the inner portion diminishes, the diameter consequently shortening. Further action of stronger acid will dissolve the isolated dentinal sheath. [Figs. 10 and 11.]

FIG. 10.



Scheme (transverse section) after Walkhoff's opinion. *a*, Dentinal fibril. *b*, Dentinal sheath, or portion considered to be an interstice by Fleischmann. *c*, Bordering layer, or portion termed the dentinal sheath by Fleischmann. *d*, Basis substance.

FIG. 11.



Scheme (longitudinal section) after Walkhoff's opinion. *a*, Dentinal fibril. *b*, Dentinal sheath. *c*, Bordering layer. *d*, Basis substance. *e*, Odontoblast.

Observing the construction of the dentinal tissues, as described before, the dentinal fibril is originally built up, while the dentinal tubule is subsequently produced. The dentinal tubule is a transitional tissue which develops into the basis substance, and this is what I call the bordering layer.

Examining the various opinions traditionally maintained by many histologists, which I have here outlined, the minute structure of the dentin, especially the relation between the dentinal fibril and dentinal tubule, may be classified at present under three representative opinions, namely:

(1) Fleischmann's opinion, which has been accepted by histologists in general, and is now presented in almost all textbooks.

(2) Römer's opinion, which is similar to that of Kölliker, and was published in 1852. Römer's opinion has been opposed by many scientists, he himself acknowledging that "There is but one histologist who concurs with my opinion—Dr. Fasoli of Italy."

(3) Walkhoff's opinion, which disagrees entirely with Fleischmann's, and seems not to have been accepted by many histologists.

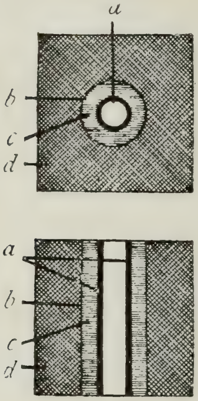
I wish, now, to observe the differences between the three opinions by comparing them one with the other.

OPINIONS COMPARED: RÖMER AND FLEISCHMANN.

As is seen in Figs. 12 and 13, they coincide in the opinion that *a* is the so-called dentinal fibril, or the process of the odontoblast. Fleischmann considers the dentinal fibril to be the contents of the dentinal tubule, and a solid substance, while Römer considers it to be a tubular substance containing liquid, or the same as the dentinal tubule.

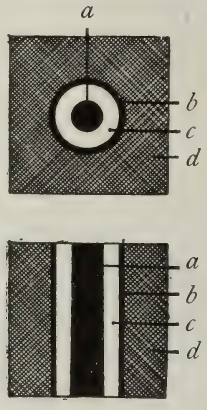
Fleischmann considers *b* as the dentinal sheath, which belongs to the basis substance, and stains deeply with hematoxylin, being strong in resistance to acids and alkalis, and isolatable. Römer does not explain the existence of this layer particularly. Regarding *c*, Fleischmann considers this an interstice caused by the contraction of the dentinal fibril,

FIG. 12.



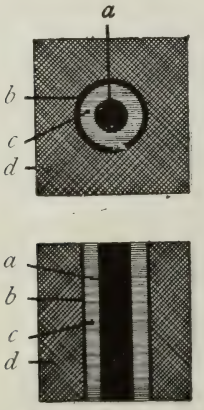
Scheme after Römer's opinion. Transverse and longitudinal sections. *a*, Dentinal fibril or dentinal tubule, tubular in shape and having a semi-fluid inside. *b*, Römer does not recognize this layer particularly. *c*, Slightly calcified basis substance, or the so-called dentinal sheath according to Römer's nomenclature. *d*, Basis substance.

FIG. 13.



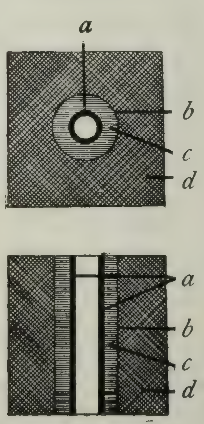
Scheme after Fleischmann's opinion. Transverse and longitudinal sections. *a*, Dentinal fibril, solid and contracted. *b*, Dentinal sheath, isolatable by mechanical and chemical means. *c*. Interstice caused by contraction of the dentinal fibril. *d*, Basis substance.

FIG. 14.



Scheme after Walkhoff's opinion. Transverse and longitudinal sections. *a*, Solid dentinal fibril. *b*, Bordering layer between so-called dentinal sheath after Walkhoff, *c*, and the basis substance. *c*, So-called dentinal sheath after Walkhoff, stainable with pigments and isolatable by acids or alkalis. *d*, Basis substance.

FIG. 15.



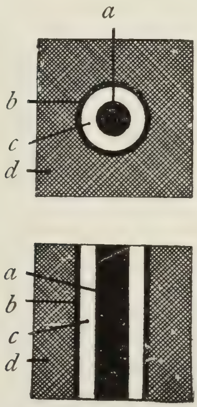
Scheme after Römer's opinion. Transverse and longitudinal sections. *a*, Dentinal fibril or the dentinal tubule, tubular in shape and having a fluid inside. *b*, Römer does not recognize this layer particularly. *c*. Slightly calcified basis substance, or the so-called dentinal sheath according to Römer's nomenclature. *d*, Basis substance.

the dentinal fibril filling the dentinal tubule when the tooth is alive. According to Römer, this part is originally in existence, and not the product of mechanical action, but rather a slightly calcified basis substance—a substance comparable to the dentinogenic zone.

RÖMER AND WALKHOFF.

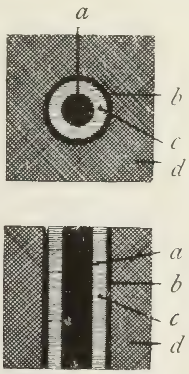
Römer considers *a,* in Figs. 14 and 15, as a dentinal fibril or the dentinal tubule, while Walkhoff considers it a solid substance. Regarding *b,* Walkhoff is of opinion that this is the bordering layer or the portion of the so-called dentinal sheath, *c,* or dentinal sheath (Fleischmann's nomenclature) which develops into the basis substance. Römer does not claim the existence of any layer in this part. He believes *c* to be a slightly calcified basis substance, while it is called a dentinal sheath by Walkhoff and is further considered to be isolatable, as it is resistant to acids or alkalis, which also indicates that the dentinal tubule has a comparatively thick wall. This part is, he says, composed of dentinal fibrils, and does not belong to the basis substance.

FIG. 16.



Scheme after Fleischmann's opinion. Transverse and longitudinal sections. *a,* Solid and contracted dentinal fibril. *b,* Dentinal sheath, isolatable by mechanical and chemical means. *c,* Interstice resulting from the contraction of the dentinal fibril. *d,* Basis substance.

FIG. 17.



Scheme after Walkhoff's opinion. Transverse and longitudinal sections. *a,* Solid dentinal fibril. *b,* Bordering layer between so-called dentinal sheath after Walkhoff, *c,* and the basis substance, *d.* *c,* So-called dentinal sheath after Walkhoff, stainable with pigments and isolatable by acids or alkalis. *d,* Basis substance.

WALKHOFF AND FLEISCHMANN.

Both of these histologists are of the same opinion with regard to *a* in Figs. 16 and 17, *i.e.* that this is a solid dentinal fibril, but Fleischmann considers the dentinal fibril, such as shown in Fig. 17, to be much more contracted than when it was alive.

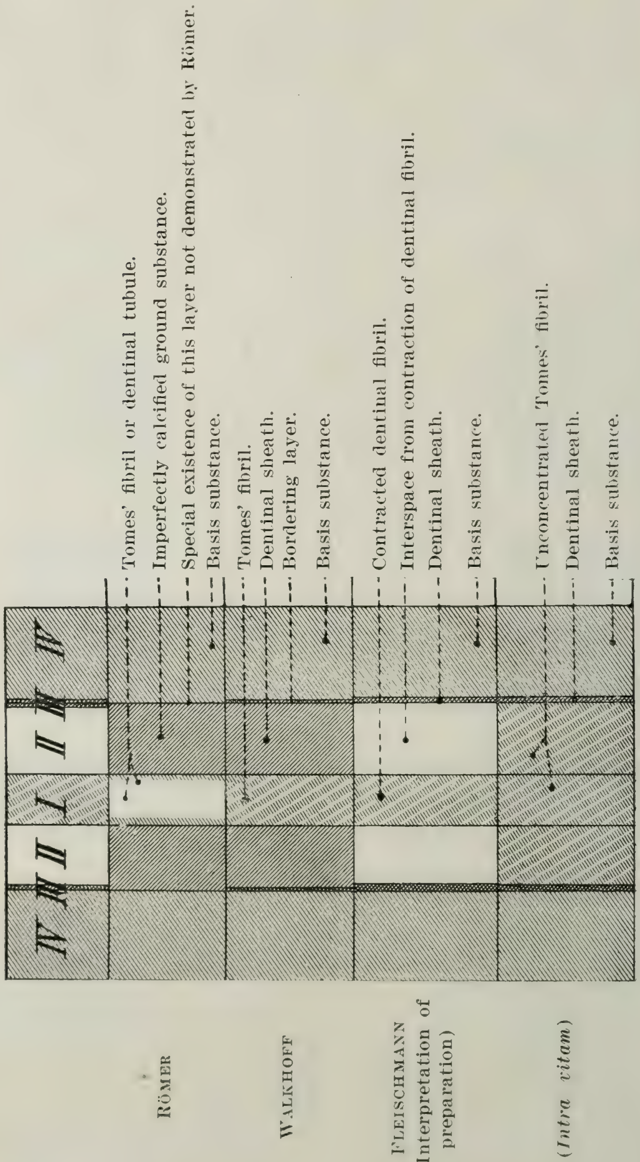
With regard to *b,* Walkhoff calls this simply a bordering layer, and holds that though this layer is stained in the decalcified section, it is less resistant to acids and alkalis, and unisolatable, while Fleischmann calls it a dentinal sheath, elastic and isolatable by acids or alkalis.

Walkhoff calls *c* the dentinal sheath, an elastic substance, while Fleischmann regards it as a product mechanically brought forth, or an interstice resultant from the contraction of the dentinal fibril during the preparation of the specimen.

THE DIFFERENCES DISCUSSED.

I wish now to discuss the differences among the three histologists, Fleischmann, Römer, and Walkhoff, using the scheme planned by Kantrowicz, *Deutsche Zahnheilkunde in Vorträgen*, H. 21, 1911, S. 43.

Fig. 18.


IV
III
II
I
II
III
IV
Tomes' fibril or dentinal tubule.
Imperfectly calcified ground substance.
Special existence of this layer not demonstrated by Römer.
Basis substance.
Tomes' fibril.
Dentinal sheath.
Bordering layer.
Basis substance.
Contracted dentinal fibril.
Interspace from contraction of dentinal fibril.
Dentinal sheath.
Basis substance.
Unconcentrated Tomes' fibril.
Dentinal sheath.
Basis substance.
Römer
Walkhoff
Fleischmann (Interpretation of preparation)
(Intra vitam)

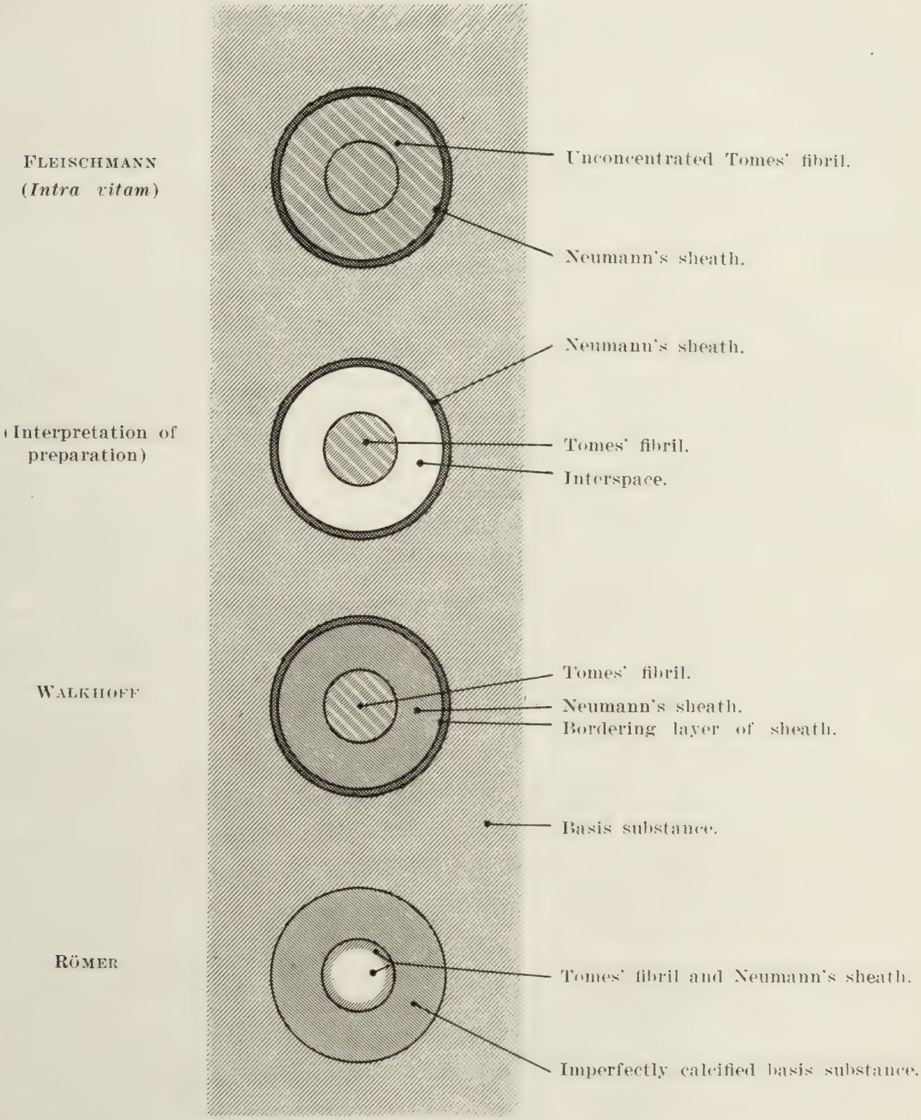
Scheme showing the structure of dentinal tubules in longitudinal section. (After Kantrowicz.)

In Fig. 18, part I is the process of the odontoblast, the dentinal fibril or Tomes' fibril, which is accepted by all three histologists. It should be remembered, however, that there is this difference among them: Römer claims this to be a tubular substance in which liquid circulates, Walkhoff considers it a solid fibril, and Fleischmann regards it as a solid fibril contracted by reagents.

With regard to part II, Römer thinks it is a slightly calcified portion of dentin, comparable to the so-called dentinogenic zone; Walkhoff calls it a dentinal sheath, a substance changed from the dentinal fibril, and isolatable by mechanical and chemical means; while Fleischmann insists that it is not of an original existence, but is an interstice resultant from the contraction of the dentinal fibril.

With regard to the III, Römer does not recognize its existence, while Walkhoff calls it a bordering layer of the dentinal sheath, less resistant to acids or alkalis; Fleischmann terms it a dentinal sheath, isolatable mechanically and chemically.

Fig. 19.


FLEISCHMANN
(*Intra vitam*)
Unconcentrated Tomes' fibril.
Neumann's sheath.
Neumann's sheath.
(Interpretation of preparation)
Tomes' fibril.
Interspace.
WALKHOFF
Tomes' fibril.
Neumann's sheath.
Bordering layer of sheath.
Basis substance.
RÖMER
Tomes' fibril and Neumann's sheath.
Imperfectly calcified basis substance.

Scheme showing the structure of dentinal tubules in transverse section.

To sum up the above-mentioned opinions, the points of difference pertain to the following questions:

(1) Is the dentinal fibril or Tomes' fibril the process of the odontoblast?

(2) What structure has the dentinal fibril?

(3) Is the layer III in Kantrowicz' scheme of real existence?

(4) What part is the so-called dentinal sheath?

(5) What part is isolated by mechanical or chemical means?

(6) What is the relation between the dentinal fibril and the dentinal tubule when the tooth is alive?

III. Technique.

In order to study the questions just enumerated, the writer prepared specimens according to the following methods. As material, the writer used chiefly fresh human teeth, while carious teeth, pulpless teeth, or teeth dried for over ten years, were used sometimes for comparison.

(*a*) PREPARATION OF DECALCIFIED SECTIONS.

As a fixing fluid the writer first adopted Müller's fluid and Zenker's fluid, but failing to find any advantage in them, he used chiefly a 4 per cent. formalin solution in which the teeth were immersed for from one to three days, and then washed in water. In several cases he also used teeth that had been placed in formalin fluid for a longer time.

As a decalcifying fluid, the writer adopted a solution of nitric acid from 5 to 8 parts, formalin 10 parts, and 90 parts of water, with sometimes from 20 to 40 parts of alcohol added to it, to effect a more rapid and even penetration of the tissue. Formic acid 33 per cent. and hydrochloric acid 5 per cent. were also used at times. The tooth remained in the decalcifying fluid for from one to two weeks, the fluid being changed three or four times. However, as the immersion of a tooth in the decalcifying fluid for a long time would hinder its staining quality very much, the writer immersed in the fluid a fragment of tooth structure 2 mm. or 3 mm. in thickness which had been ground down on a grinder or broken with excising forceps. Thus two or three days would be sufficient for decalcification and the staining quality would not be interfered with.

When the tooth had been sufficiently decalcified it was washed under running water and hardened in alcohol of an increasing strength and imbedded in celloidin (a few in paraffin), and then prepared in thin sections of from 5 to 10 microns in thickness. In sections of more than 10 microns in thickness the minute structure could not be followed. As a staining solution, the writer adopted chiefly Delafield's hematoxylin, in which the section was immersed for from 6 to 12 hours, and sometimes for a day, and, after washing, placed in alcohol and carbol-xylol, and mounted in balsam.

Judging from the writer's experience, the simple stain of hematoxylin seems to be most advantageous in staining dentin. However, several times the writer has adopted eosin and Van Gieson's picro-fuchsin as the final stain.

The most valuable stain next to hematoxylin was Ziehl's carbol-fuchsin diluted with distilled water to five or ten times, the so-called Pfeiffer's solution, the sections being stained according to the following method:

(1) After washing the section in water, it was immersed in the fluid for from 5 to 10 minutes or more.

(2) The section was placed in 97 per cent. alcohol or absolute alcohol and allowed to remain for from 2 to 5 minutes.

(3) Mounted in balsam after it had been made transparent by xylol or oil of bergamot. Carbol-xylol sometimes is apt to fade the stain.

For staining, care should be taken to use a fresh solution of Ziehl's carbol-fuchsin, as those made more than two weeks were not satisfactory for the purpose.

The alcohol used for differentiation after the section has been stained should not be below 97 per cent., nor should the tooth be allowed to remain in alcohol for a longer time than 5 minutes, otherwise the stains will fade. In microscopical examinations where the dentin and basis substance were stained so evenly that the minute structure could not be followed, there was either imperfection of differentiation or shortness of staining duration. The advantages of carbol-fuchsin as the stain for dentin sections are several. Although it reveals all structures as distinctly as hematoxylin, yet it does not yield any precipitation when grinding down the section, and only a few minutes will suffice for staining. Especially is it far better than hematoxylin or any other anilin dye as the final stain for those sections in which dentin had been macerated chemically, and as the stain of its process and odontoblast separated mechanically as will be described hereafter. Its only defect is that it fades gradually and is so fine a color that it cannot be preserved long. Fleischmann recommended safranin as the stain for dentin sections, but the writer believes fuchsin to be far better.

(*b*) PREPARATION OF GROUND SECTIONS.

In order to compare with decalcified sections the writer prepared many ground sections. The teeth were ground down according to the ordinary method, and were mounted in dehydrated balsam, most of them being stained with fuchsin, the remainder being unstained. These ground sections were several times thinner than 5 microns.

The ground sections contained calcium salts and could not be stained with hematoxylin. When immersed in hematoxylin, it yields precipitation only on the surface and one cannot obtain as good a section as with the decalcified section. Fuchsin, however, is an excellent stain for the ground sections. The writer employed the following methods for staining the ground sections:

First method: The thinly ground section was immersed for from 12 to 24 hours in fresh carbol-fuchsin, filtered, then placed in from 70 to 80 per cent. alcohol, differentiated until the stain became permanent (viz, in from 5 to 10 minutes) and then mounted in xylol after washing with absolute alcohol.

Second method: The dentin section was ground, not so thin, and placed in a test tube containing a strong alcohol solution of fuchsin or Ziehl's carbol-fuchsin, after washing it with water, then the tube heated in a water-bath for from 3 to 6 hours. If the solution in the tube evaporates, fresh solution is added, the section finally removed from the tube, put on a grinder, ground down thinner than 10 microns, and mounted in xylol or balsam after washing with water and dehydrating with alcohol.

(*c*) PREPARATION OF GROUND AND DECALCIFIED SECTIONS.

In order to study the relation between the ground down section and the decalcified section, the writer stained a decalcified section after it had been ground down, treating it as if it were a section cut by the microtome. A section of dentin ground down to an extremely thin piece on a grinder was immersed in from 5 to 10 per cent. nitric or hydrochloric acid for decalcification for from 3 to 5 minutes after having been washed with water, was then washed again with water and stained with hematoxylin or fuchsin. In that case the stain of the dentin was very good, and not only could the structure be seen more distinctly than in the decalcified section cut by the microtome, but a peculiar structure was noted, as will be mentioned in a later chapter.

(*d*) PREPARATION OF GROUND AND DECALCIFIED SECTIONS COMBINED.

In order to observe closely the relation between ground down sections and decalcified sections, the writer adopted the following method:

First, the dentin of a fresh tooth was ground down from $\frac{1}{2}$ to 1 mm. and stained with fuchsin according to the method described in (*b*) and then placed on the grinder again and ground thinner, grinding both sides. It was then put into water, and after having been well washed, placed between folded blotting paper to absorb the moisture, and dried for two or three minutes in air. It was then placed between folded papers and cut into halves with scissors. One of the pieces was immersed into from 5 to 10 per cent. acid, decalcified, washed with water and stained with hematoxylin or fuchsin, and lastly, together with the section which had not been decalcified, placed in alcohol and xylol in succession, and then mounted in balsam.

The only defect in the above-mentioned method is that it is very difficult to imbed the ground section together with the stained decalcified section and fix the joint tightly at the cut edges. Because of this circumstance, the writer adopted the following method:

First, the ground section was stained with fuchsin according to the above method, and placed in folded blotting paper to absorb the moisture, exposed to the air for 5 minutes and then held at one edge against paraffin. The section is then heated on one side by a spirit-lamp, the paraffin at once covering the surface of the section and congealing. The precaution, however, should be taken that the paraffin does not cover the whole surface; the object is to imbed in paraffin only one half of the ground section.

The ground dentin section one part of which had been imbedded in paraffin was next immersed in 5 per cent. nitric or hydrochloric acid for two or three minutes, so that the other half of the section which had not been imbedded in paraffin would be decalcified, and then washed with water, stained with hematoxylin or fuchsin, and dehydrated with alcohol. It was then immersed in pure xylol which had been slightly heated, so that the paraffin which had adhered to one part of the ground section would be dissolved away, after which it was placed in carbol-xylol and imbedded in balsam.

By adopting this method a good ground and decalcified section combined could be easily obtained. According to the writer's own experience it is very difficult to obtain a good specimen if the imbedding of the section in paraffin is not perfect, as hematoxylin is apt frequently to yield undispersed sediment on the face of the section. On the contrary, fuchsin is very advantageous, and a fine section can be prepared.

(*e*) PREPARATION OF METAL-SALT-IMPREGNATED SECTIONS.

The methods for making tooth tissue distinct by means of precipitating and impregnating a metal salt in the dentin have been adopted by many authors. The writer used chiefly the following methods:

(1) *Impregnation with nitrate of silver.* Having prepared a thin ground-down section of dentin, it was immersed in from 2 to 5 per cent. neutral nitrate of silver solution for from 2 to 5 days so that the silver contained in the solution would thoroughly penetrate the section and after it had been washed lightly with water, placing it into such developers as pyrogallic acid or hydroquinone, allows the silver to be reduced in the light and then after it had been washed again with water, placing it on the grinder, grinding it thinner on both sides. It was next washed with water, put into 2 per cent. sodium hyposulfite for two or three minutes and mounted in balsam after being placed in alcohol and xylol.

(2) *Impregnation with chlorid of gold.* A thin ground-down section was prepared and fixed with formalin. After washing, it was placed in a solution of equal parts of 1 per cent. solution of gold chlorid (this must be absolutely neutral in quality) and 95 per cent. alcohol, kept in the dark for two or three days, and after it had been washed with water, immersed in a solution of 1 part caustic sodium and 6 parts water for from 15 to 30 minutes, and after another washing, placed in a 10 per cent. potassium iodid solution for from 12 to 24 hours. The section was next placed on a grinder and ground very thin, grinding both sides while pouring water on it. It was then dehydrated and mounted in balsam in the ordinary way.

The ground section prepared according to the above method can be stained finally with such stains as hematoxylin or fuchsin if the section is decalcified again.

(*f*) ISOLATION OF ODONTOBLASTS.

Freshly extracted teeth were split with excising forceps, the greater part of the pulps gently removed, and the remainder scraped with a sharp excavator from the walls of the pulp cavities, to which they closely adhered. The mass so obtained was laid on an objective glass and separated with a needle-point, a drop of normal salt solution being added. A cover glass was applied and the mass stained with carmine, a drop being added from the side of the cover-glass. To make a permanent specimen, the mass which was isolated on the objective glass was dried slowly and exposed to the air, and immersed in formalin solution or solution of corrosive sublimate for fixing. After being washed with water, it was stained with hematoxylin-eosin or according to choice, and mounted in balsam. According to the writer's experience, carbol-fuchsin is most advantageous for staining being particularly useful for making protoplasmic processes of cells distinct. The isolated dried specimens were immersed in the fresh ten-times-diluted solution of carbol-fuchsin for from 10 to 30 minutes, and washed well with water. After they had been placed between blotting-papers to absorb any moisture, they were exposed to the air for drying, and mounted in balsam. For the purpose of dehydration they may be passed through alcohol quickly, and then mounted in balsam after being placed in xylol. The writer also fixed young teeth, especially tooth-germs, in Müller's fluid and gently teased out the dentinal papillæ, scraping the tooth surface with a sharp knife. The mass so obtained was laid on an objective glass and separated with needle-points, a drop of normal salt solution being added; or, as in the other case, the pulps were teased out of the pulp cavities, cut into slices after imbedding them in celloidin or paraffin, and stained heavily with hematoxylin-eosin. In the latter case, upon observation of the margin of the section, a long process of odontoblasts of ciliated shape, even inclined or transverse sections of the process sometimes, could be perceived.

(*g*) THE ISOLATING METHOD, AND (*h*) THE INJECTING METHOD WITH DENTIN.

The explanation of these methods is, for convenience, given in a later section

(*i*) PHOTOMICROGRAPHY.

The writer chiefly employed Leitz' microscope for photographic purposes, and used the following lenses:

(1) Objective: Oil-immersion 2 mm. of apochromatic system, and of dry system 4 mm.

(2) Ocular: Compensation 4 and 6.

(3) Magnifying multiple—was measured correctly by objective micrometer.

(4) Plates: Agfa's Chrome Isolar chiefly used.

IV. Observations on Stained and Decalcified Sections.

When newly extracted sound teeth are fixed and decalcified, made into longitudinal sections thinner than 7 microns, stained with Delafield's hematoxylin for over six hours, imbedded in balsam, and then examined under the microscope, it is seen that numerous violet, fine tubular-looking substances which have been already enlarged, run into the basis substance of the dentin. If we further examine these sections under a much stronger microscope (over 800 magn. at least), the tubular-looking substances are seen to have thick violet bordering layers (*d*), as shown in Fig. 20, close to the basis substance (*e*). These bordering layers give off many branches (*f*) to the basis substance. Furthermore, in the central portion of the tubular-like substances there are fibrillar substances (*b*) which have stained as much as the basis substance or much more deeply. The bordering layers (*c*) of these substances present a deep violet color like that of the principal body of the fibrillar substance.

From the surrounding portion of the fibrillar substance we sometimes see fine branches running into the basis substance. Between the tubular substance (*d*) and the fibrillar substance (*b*), which latter lies in the center of the former, is seen a portion (*a*) which is comparatively transparent and stains slightly with hematoxylin, or presents a cloudy appearance or sometimes appears colorless.

In comparing every appearance described above with the scheme designed by Kantrowicz (Fig. 18), *a* in Fig. 20 corresponds to II, *b* to I, *d* to III, *e* to IV. We see that I, or *b*, is the process of the odontoblast, and should be termed the "dentinal fibril." This nomenclature has been accepted, so far without any opposition, by many histologists. The writer also believes this to be correct, from the following facts:

PROCESS OF THE ODONTOBLAST.

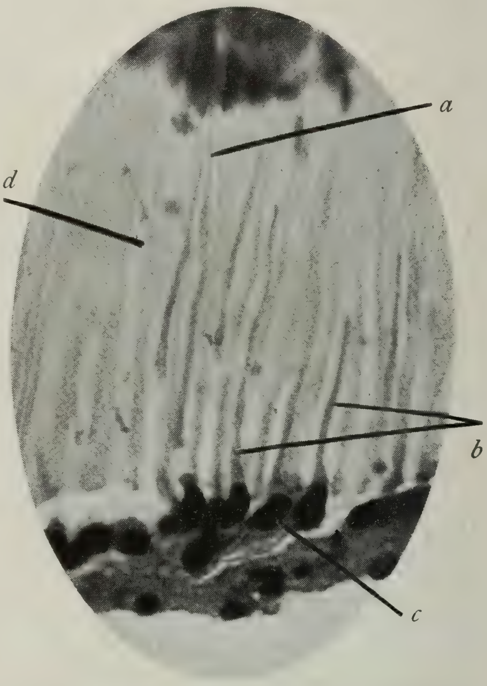
(1) When examination is made of the longitudinal sections which contain the dentinogenic zone near the pulp cavity and the layer of the odontoblasts, we clearly observe that the processes of the odontoblasts, as in Fig. 21, pass into the dentin, and develop into the fibrillar substance in the center of the tubular-like substance, this being the same section as shown in Fig. 20.

(2) On examining the sections under object glasses after detaching the pulp from the surface of the dentin with a needle, we can extract the process of the odontoblast from the tubular-like substance.

(3) In the preparation (Fig. 22), made after the method *"f"* as described in the section on Technique, we see that the process of the odontoblast shows the same relation in its susceptibility to pigments and the resistance toward the chemical reagents, as in the fibrillar substance in the center of the tubule.

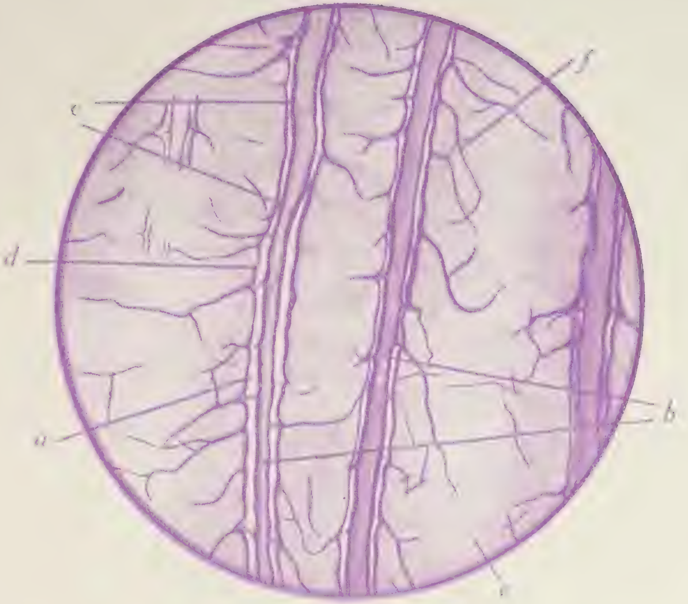
When we examine a transverse section of the dentin, prepared by the same method just referred to, under slight magnification, we see numberless fairly transparent and small round bodies in the midst of the violet substance. But when examined under a magnification of more than 800 diameters, these small round bodies are bordered with a deep violet layer (*d*) as seen in Fig. 23; from the latter, branches start into the basis substance (*e*). In the centers of these round bodies, there are small circular areas (*c*) which stain with hematoxylin. Frequently we observe extremely fine branches given off from the borders of these circles. The inner portion (*b*) of this small circular area (*c*) appears transparent in most instances, but presents sometimes a solid appearance when stained deeply with the pigment. The portion (*a*) between the round bodies (*d*) and the small circular areas (*c*) is sometimes transparent, or

FIG. 21.



Shows a dentinogenic zone and odontoblasts. Delafield's hematoxylin staining. Magn. 1050 diam. Decalcified. *a*, Dentinal fibril. *b*, Dentinal fibrils or the processes of the odontoblasts. *c*, Odontoblast. *d*, Dentinal tubule, hollow in appearance from absence of the dentinal fibril.

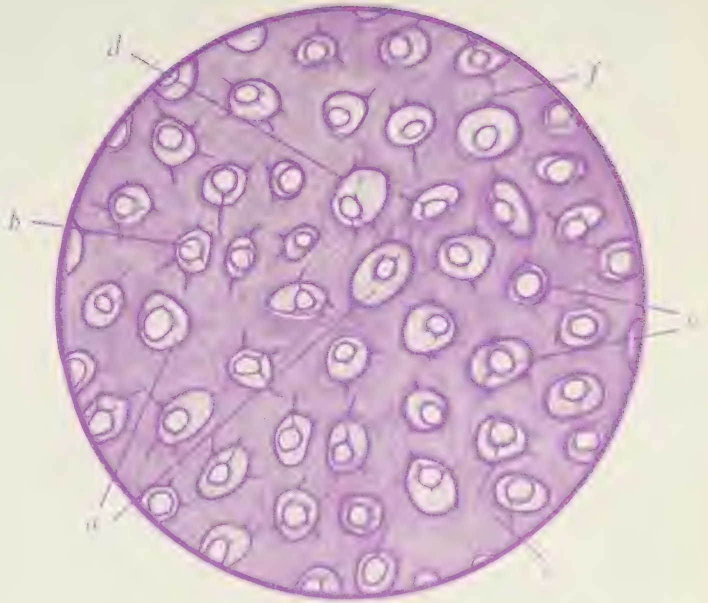
Fig. 26



Longitudinal section of dentin at the neck of a young canine, decalcified; Delafield's hematoxylin staining. Magn. about 1500 diam. (sketched). a, Transparent layer between dentinal tubule and the wall of the Tomes' fibril. b, Dentinal fibril or Tomes' fibril. c, Bordering layer of the dentinal fibril. d, Wall of the dentinal tubule. e, Basic substance. f, Branch of the dentinal tubule.

(Apochrom. objective 2 mm.; compensation oc. 12.)

Fig. 27



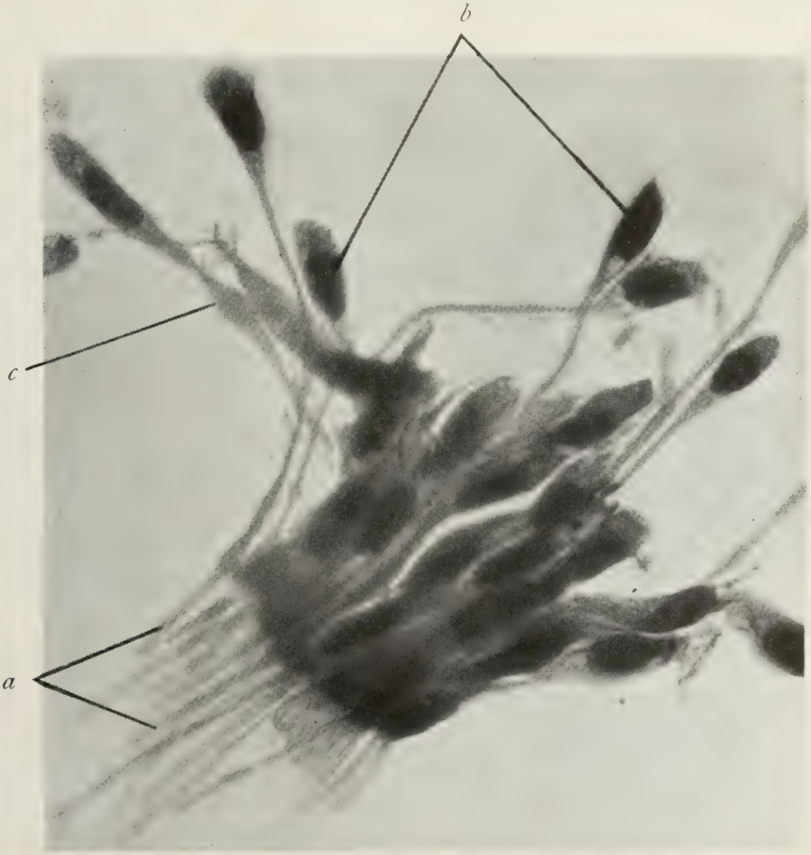
Transverse section of dentin, decalcified, taken from the crown of a young canine; Delafield's hematoxylin staining. Magn. about 1500 diam. (sketched). a, Transparent layer between the dentinal fibril and the wall of the dentinal tubule. b, Dentinal fibril or Tomes' fibril. c, Bordering layer of the dentinal fibril. d, Wall of the dentinal tubule. e, Basic substance. f, Branch of the dentinal tubule.

(Apochrom. objective 2 mm.; compensation oc. 12.)

sometimes with a cloudy appearance, or slightly stained with hematoxylin.

On comparing the observations above noted with those made on the longitudinal sections, we conclude that *a, b, c, d, e, f,* in Fig. 20, correspond to the same indicators in Fig. 23. Consequently, the small circular areas (*c*) in the centers of the round bodies are found to be the dentinal fibrils showing from their transverse surfaces.

Fig. 22.

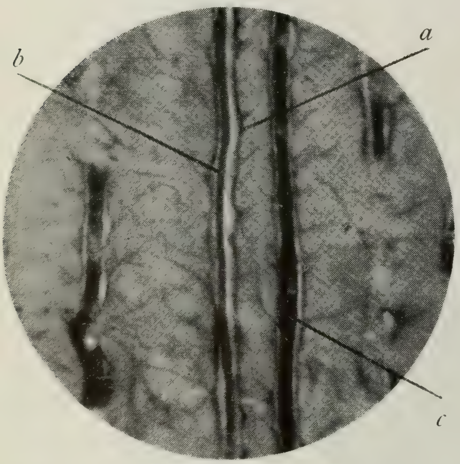


The odontoblasts and their processes isolated by mechanical means from the surface of the pulp cavity. Carbol-fuchsin staining. Magn. 1050 diam. *a*, Dentinal processes of the odontoblasts, or the dentinal fibrils. *b*, Nucleus of the odontoblasts. *c*, Body or protoplasm of the odontoblast.

Römer noticed frequently that the dentinal fibrils presented a circular appearance in the transverse section of the dentin such as the writer has just described. With this assertion he states further that the process of the odontoblast is tubular, and that the wall of the tubule is developed from the membrane of the odontoblasts, and also that lymph circulates in the tubules. With regard to the structure of the dentinal fibrils, Walkhoff holds that the dentinal fibril has so fine a structure that even very strong magnification will fail to show it satisfactorily. However, he claims that the dentinal fibrils are of a tubular structure the same as the dentinal tubules.

Kantrowicz says that the normal processes of the odontoblasts lie in the center of the dentinal tubules in the longitudinal sections, that they are homogeneous, and are often observed to show special outlines which stain stronger at the margins. This coincides with the fact that the dentinal fibrils appear tubular in the transverse sections. It may be explained that this outline is caused by the contraction of solid and homogeneous plasmic fiber. In other words, the bordering layer of the dentinal fibril, which became denser due to contraction, would refract light and take pigmentation exceedingly well.

Fig. 24.



Longitudinal section of dentin decalcified. Delafield's hematoxylin staining. Magn. 1050 diam. *a*, Wall of the dentinal tubule or so-called dentinal sheath. *b*, *c*, Dentinal fibrils, with a false appearance like solid substance from excess of staining on the surface.

On the other hand, Fleischmann and many other histologists have considered that the dentinal fibril is simply a solid and homogeneous process of the protoplasm, but they have never given any special descriptions with regard to its structure.

From the writer's own observations, it seems proper to claim that the dentinal fibril has, in the transverse section, a bordering layer which stains deeply with hematoxylin, as Römer held. In the preparation which contains a section of the pulp extracted from the cavity and imbedded in celloidin, the writer made observations on the process of the odontoblast in other cases of oblique or transverse sections in which there appeared to be a circle with a bordering layer. Further, he could observe in the part of the odontoblast which separated from the wall of the pulp cavity and stained with hematoxylin, that there was developing into the bordering layer of the process of the odontoblast some substance quite like the membrane of the cell.

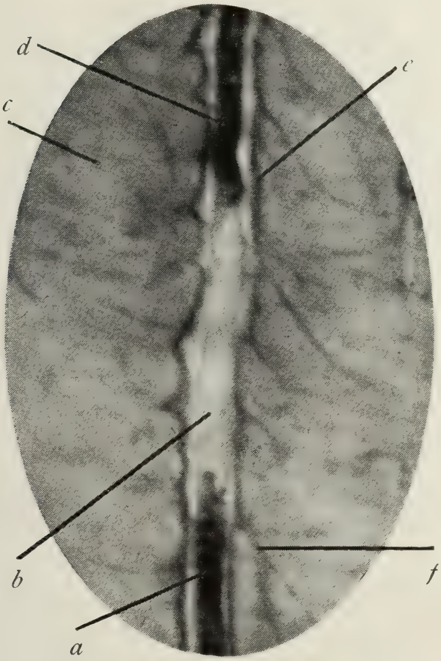
It is frequently observed that the dentinal fibril has two parallel lines in its border, but it is not so in every case; sometimes the whole body of the fibril takes a deep stain uniformly without any appearance of these parallel lines. (Fig. 24.) In other cases some fibrils would be seen to have conspicuous lines, while some in the same section were positively homogeneous. One dentinal fibril would stain deeply and be homogeneous apparently at some part, and yet the remainder would be stained only at the border, the central portion not taking any pigmentation at all.

CHARACTERISTICS OF THE DENTINAL FIBRIL.

The writer explains these phenomena as follows: The dentinal fibrils have bordering layers, and if the superficial layer takes too much pigmentation, there arise various appearances. In Fig. 25, the portion of the dentinal fibril which seems uniformly stained is the surface of the fibril which took much pigmentation, and the transparent portion (*b*) shows the superficial layer which did not stain, only the border of the fibril staining.

As already described, the dentinal fibril or the process of the odontoblast has a border which stains deeply with such coloring matters as hematoxylin; from this fact Römer must have concluded that the dentinal fibril possesses a tubular structure and is the same thing as the dentinal tubule. I dare say the opinion held by Fleischmann that the dentinal fibril is a solid and homogeneous process of protoplasm was based upon a lack of satisfactory observation. But Römer's view that the dentinal fibril is tubular and that lymph circulates inside the tubule cannot be concurred in at all by the writer. If it be true that the bordering layer of the dentinal fibril is, as he believes, developed from the membrane of the odontoblast, the content of the fibril is not lymph, but undoubtedly must be the protoplasm of the odontoblast.

Fig. 25.



Longitudinal decalcified section of dentin. Delafield's hematoxylin staining. Magn. 1800 diam. *a* and *d*, Dentinal fibril, with a false appearance like solid substance from excess of staining on the surface. *b*, Dentinal fibril not stained. *c*, Basis substance. *e*, Wall of dentinal tubule. *f*, Fine branch of dentinal tubule.

Now and then we observe in the dentinal fibril tubular swellings, oval in shape, in several places in the process of the dentinal fibril. Though what these swellings mean is not clear, the writer presumes, from his observations on many cases, that they are the portion from which comparatively large branches of the dentinal fibrils are to put forth.

Then the question arises, What is the tubular-like substance (*d*) which has deep violet bordering layers in the basis substance, shown in the longitudinal section in Fig. 20 (III in the scheme in Fig. 18). This layer was described as the "dentinal sheath" by Fleischmann and Kantrowicz, and Walkhoff explained it as a layer bordering the basis substance. We clearly see this layer in Figs. 24 and 25. Römer has not given any explanation of it, but I believe he would not deny the existence of this layer now, as when I was with him he acknowledged its existence in my preparation, which showed the layer in question stained deeply with hematoxylin.

This layer stained not only with hematoxylin, but is tinged by the fuchsin staining method and presents a deep crimson color. This layer, however, will not stain in some instances, which failure may depend on the following conditions:

(1) When the section is too thick.

(2) When the dentin fails to take the stain properly, due to the overdue action of acid at the time of decalcification.

(3) When the staining agent is not suitable. For instance, in some cases the bordering layer will be seen distinctly with fuchsin or hematoxylin, but to be indistinct with eosin or picro-fuchsin, staining the basis substance deeply.

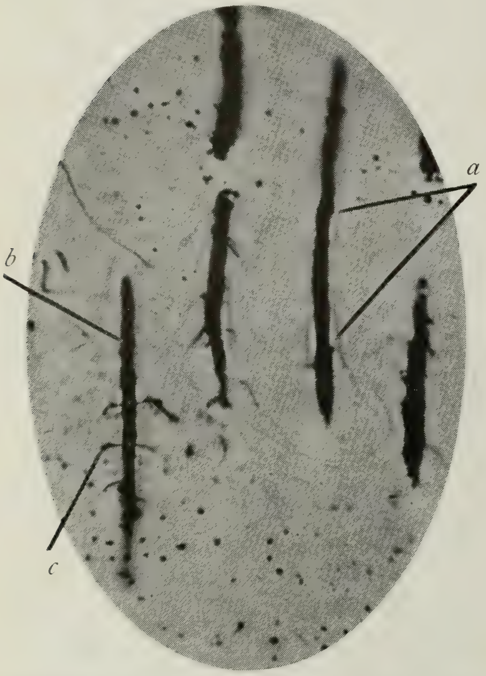
(4) When the hematoxylin staining is carried out in too short a time.

To have this layer distinctly present, sections should be allowed to stand from 6 to 12 hours or longer in such a staining agent as Delafield's hematoxylin.

In examining the bordering layer, well stained, in the section, it is frequently observed that many branches (starting from the outer side of the border) are given off into the basis substance, and that a large number of them anastomose with neighboring branches.

According to Fleischmann this substance is a branch of the dentinal tubule and possesses an equally fine tubular structure, inside of which the branch of the dentinal fibril passes. But he declared he could obtain practically no observation of the dentinal fibril, and finally decided that the branches were broken off and lost from the contraction of the dentinal fibrils. But the writer actually observed in beautifully prepared sections that the dentinal fibrils give off branches which pass into the branches of the so-called dentinal sheaths. (Fig. 20.)

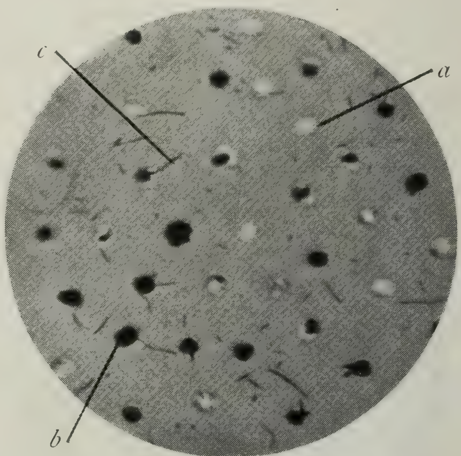
Fig. 26.



Longitudinal ground section of dentin, impregnated with nitrate of silver, decalcified in 10 per cent. solution hydrochloric acid and stained with hematoxylin. Magn. 1050 diam. *a*, Wall of dentinal tubule stained with hematoxylin. *b*, Dentinal fibril, presenting a black tint resulting from precipitation of the silver salt, while its branch, *c*, is distinctly observable.

And further, very often there could be recognized, in the tranverse section, branches starting from the outer side of the circular dentinal fibril. (Fig. 23.) In the ground section which was impregnated with metallic salts, then decalcified, and afterward stained with hematoxylin according to the method (*e*) described in the section on Technique, it is distinctly noticed that the branches given off from the dentinal fibrils penetrate into the basis substance, as in Figs. 26 and 27. From this fact the writer opposes the opinion that the branches broke off and were lost from the contraction of the dentinal fibrils, as maintained by Fleischmann. His opinion may have been based on the fact that he could not observe the branches owing to the imperfection of the staining methods employed.

Fig. 27.



Transverse dentinal section, impregnated with nitrate of silver, decalcified in 10 per cent. solution hydrochloric acid, and stained with hematoxylin. Magn. 1050 diam. *a*, Hollow dentinal tubule resulting from the absence of the dentinal fibril. *b*, Dentinal fibril, presenting a black tint caused by the precipitation of silver salt; the branch is distinctly observed. *c*, Branch of the dentinal fibril.

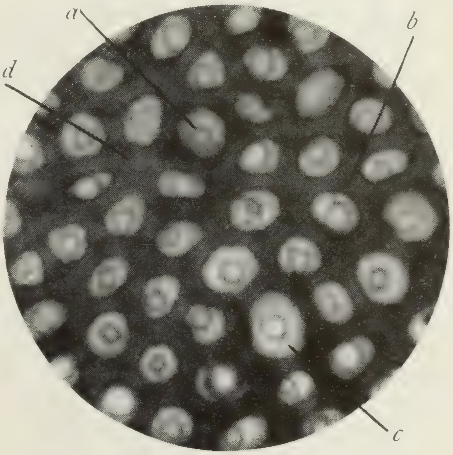
RELATION BETWEEN THE DENTINAL FIBRILS AND DENTINAL TUBULES.

At present I am of the opinion that the tubules which penetrate the ground substance have borders which stain with hematoxylin or fuchsin more deeply than the basis substance, and this border (see Figs. 20 and 23, *d*) gives off tubular branches again, through which the branches of the dentinal fibrils penetrate just as the former pass along. In the penetration of dentinal fibrils through the basis substance of the dentin, the relation between the tubules and fibrils may be compared to the relation of the bone cell, and the processes around the bone cell, to the bone lacunæ and the bone canaliculi given off from the bone lacunæ. If this comparison is justified, there must be positively some tubules, or so-called dentinal tubules, which should contain the dentinal fibrils. If this be a fact, it can be said that *d,* in Figs. 20 and 23, is the wall of the dentinal tubule and is called the "dentinal tubule"—as it is in the same condition as the dentinal fibrils in both shape and direction of branches. In this respect I concur with the opinion of Fleischmann and Kantrowicz. But it is an important question to decide whether or not the border above mentioned is the same with the so-called dentinal sheath, or Neumann's sheath—which has a special resistance to either the chemical reagent or the mechanical treatment—as believed by many since Neumann. I shall treat this problem later on; now, I wish to present the results of my observations upon the comparatively transparent layer (*a,* Figs. 20 and 23) which intervenes between the wall of the dentinal tubule and the dentinal fibril in question.

THE TRANSPARENT LAYER BETWEEN THE DENTINAL FIBRIL AND THE DENTINAL TUBULE.

The transparent layer which lies between the dentinal fibril and the wall of the dentinal tubule was believed to be an interstice by Fleischmann, termed "dentinal sheath" by Walkhoff, and explained as "slightly calcified basis substance" by Römer. Walkhoff says that this layer can be observed frequently in specimens which take too much pigmentation with hematoxylin or eosin, even though washed with water for a considerable time. If this layer be an interstice, it must certainly be seen to show no color. This also agrees with my observation, for the layer has been frequently stained with eosin or picro-fuchsin, or presents a light violet tint with hematoxylin, and granular substances are observed in it. Besides, we often observed, under strong magnification, that the layer stained out in the transverse section showed the granular appearance vividly. (Fig. 28.) But in this case we should be careful not to confuse this with the occasional appearance of the basis substance in the deep or superficial portion that takes the stain clearly owing to the special thickness of the specimen.

FIG. 28.



Transverse decalcified section of dentin, hematoxylin and eosin staining. Magn. 1080 diam. *a,* Dentinal fibril, which appears tubular. *b,* Wall of the dentinal tubule, or so-called Neumann's sheath. *c,* Transparent layer between the dentinal tubule and the dentinal fibril, or the interstice caused by the expansion of the dentinal tubule. *d,* Basis substance.

Fleischmann and Kantrowicz insist upon this being an interstice, on the following grounds:

(1) This layer takes no stain and is not recognized as being of the histological structure.

(2) The dentinal fibril does not lie in the center of the dentinal tubule; it lies close to one side in most cases. In the longitudinal section it is observed in the center or close to one side, or sometimes

it touches the wall of the dentinal tubule. This is a phenomenon caused by the longitudinal and crosswise contraction of the dentinal fibril. In other words, it shows that the transparent portion between the dentinal fibril and the dentinal sheath is an empty space. If this space is a layer, such as a slightly calcified basis substance or the dentinal sheath, after Römer's or Walkhoff's opinion, the dentinal fibril should be explained, as it is surrounded with the sheath, or the basis substance, the wall of which varies in thickness.

(3) They observed frequently the appearance of dentinal tubules in a transverse section of dentin, as shown in Fig. 7, which do not contain dentinal fibrils at all. This may be explained by the probability that the dentinal fibrils were removed while making the specimens. But in such a case they could not make any difference between the empty place due to the absence of the fibrils and the transparent portion in question. From this fact they came to the conclusion that the transparent portion was an empty space.

(4) They observed the transparent layer between the dentinal fibrils and the dentinal sheath, rather close to the surface of the dentin—that is, the superficial part, but in the deep portion immediately around the pulp cavities they were almost always unable to find the transparent layers, the dentinal fibrils filling the dentinal tubules. If that is correct, the transparent layer must be in reality an interstice due to the contraction of the dentinal fibrils by the action of reagents.

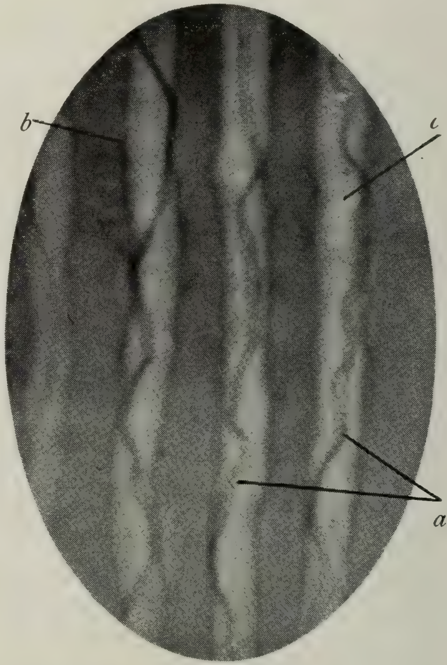
RELATION BETWEEN THE DENTINAL TUBULE AND THE DENTINAL FIBRIL NOT CONSTANT.

In examining many decalcified sections I learned that the relation of the dentinal fibril to the dentinal tubule is not constant. In other words, the transparent layer which localizes between the dentinal fibril and the wall of the dentinal tubule is quite variable in thickness, and the following phenomena are observed on the whole:

(1) Through a large dentinal tubule, as is shown in Fig. 29, a small fibril, wavy or rather spiral in appearance, passes between the two, and there is observed a comparatively large transparent area.

(2) Fig. 30 shows the dentinal fibril passing just in the middle of the dentinal tubule, and fairly light layers are recognized on both sides of the fibril.

FIG. 29.



Longitudinal decalcified section of dentin. Delafield's hematoxylin and eosin staining. Magn. 1800 diam. *a*, Dentinal fibrils, passing into the comparatively large dentinal tubules in a wavy manner. *b*, Wall of the dentinal tubule, or so-called Neumann's sheath. *c*, Part considered as an interstice of the dentinal tubule.

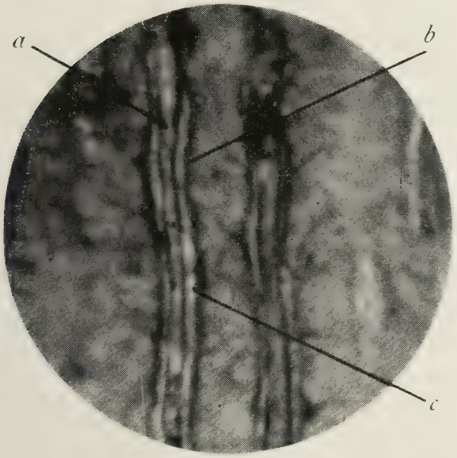
(3) The dentinal fibril almost fills the dentinal tubule, and there remains only a small portion of the transparent layer. (Fig. 30, right side.)

(4) The dentinal fibril fills the dentinal tubule completely, no transparent area being recognized. (*b*, Fig. 31.)

(5) In Fig. 31, at *a*, we can readily

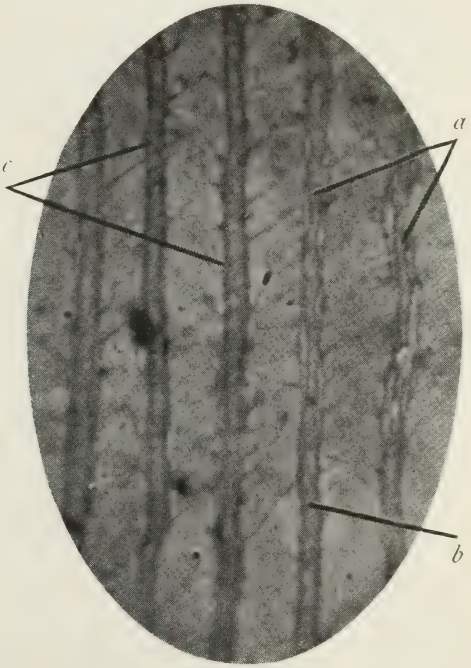
see the difference between the dentinal fibril and the wall of the dentinal tubule, but in *b* and *c* the difference is not distinguishable. This shows that in the case of *b* and *c* the dentinal fibril fills the tubule.

FIG. 30.



Longitudinal decalcified section of dentin. Delafield's hematoxylin staining. Magn. 1800 diam. *a*, Dentinal fibril appearing as a tubule. *b*, Dentinal wall, or so-called Neumann's sheath. *c*, Transparent layer between dentinal tubule and dentinal fibril, or interstice caused by expansion of the dentinal tubule.

FIG. 31.

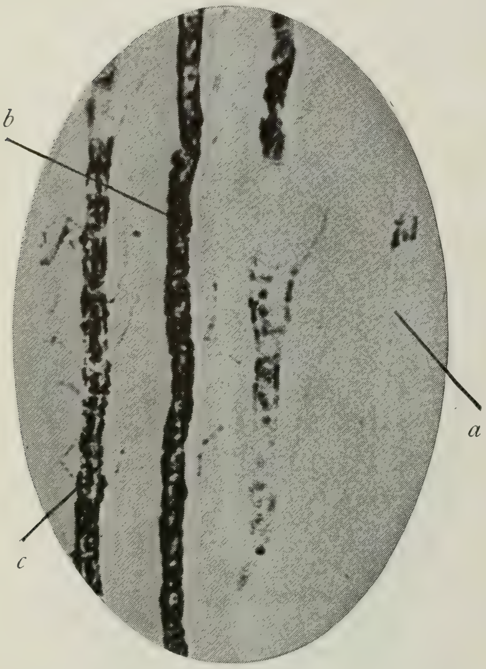


Longitudinal decalcified section of dentin. Delafield's hematoxylin staining. Magn. 1050 diam. *a*, This portion shows the dentinal tubule not filled by the dentinal fibril; there is observed between the two a transparent layer or an interstice. *b* and *c*, Here is shown the portion of the dentinal tubule filled with the dentinal fibril; no interstice is observable between the two.

From the facts above alluded to, it is clear that the transparent area between the dentinal fibril and tubule does not exist naturally. So that it is unreasonable to declare, with Römer and Walkhoff, that the transparent portion—which in reality is not naturally existent—is a part of the basis substance, or that it is a dentinal sheath which has a peculiar quality. I am inclined to agree with the opinion that the transparent portion is an interstice between the dentinal fibril and the tubule, as held by Fleischmann. In fact, by the assumption that the transparent place is an interstice, we are able to interpret the observations with the microscope, which vary in every case, as remarked before. The explanation of this transparent portion has been established hitherto by Fleischmann and other histologists, when they dealt with the structure of this layer, on the premise that the dentinal fibril contracts under the action of reagents. But they did not bring out any concrete evidence to prove the contraction of the dentinal fibril, and consequently their opinions were based on uncertain premises. The transparent layer, or the interstice, may not only be explained by the inference that it has come from the contraction of the dentinal fibril, but the extension of the wall of the dentinal tubule may present the appearance of the regular transparent layer. In the specimen shown in Fig. 29 we believe the appearance of the transparent area to have been caused by the extension of the dentinal tubule rather than by the contraction of the dentinal fibril.

In this connection Walkhoff says: “If our methods of impregnation would establish such shrinkage at the beginning of their application, naturally they would be useless for any type of minute histologic examination. However, we can observe that the remaining protoplasm of the odontoblasts, which are sending out the dentinal fibers through the dentin, is not at all contracted in the foregoing manner.”

Fig. 32.



Longitudinal decalcified section of dentin. Thionin and picric acid staining after Schmorl's method. Magn. 1050 diam. *a*, Dentinal fibril and dentinal tubule which do not take any stain; or portion in which no granular precipitation of the pigment takes place. *b*, Portion of dentinal fibril and tubule showing a granular precipitate of the pigment deposits. *c*, Portion of dentinal fibril and wall of the dentinal tubule where a granular precipitation of the pigment occurs; the difference observable between the two is but slight.

Now, after dwelling long upon this subject, we face the difficulty of having to solve this problem by adhering to the researches on the decalcified specimens only. I shall offer further explanation in the later portions of this report, upon the transparent space in question—what the space is composed of, how it comes about if it be an interspace, why it presents a granular appearance, and why it sometimes takes stain with pigments.

It is a well-known fact that we can obtain very beautiful specimens of decalcified tooth sections by staining them in thionin. A number of specimens were stained for observation by the following method (after Schmorl):

(1) The celloidin section was washed in water for ten minutes.

(2) Placed in thionin solution—50 per cent. solution of alcohol saturated with thionin, 1 cc., and distilled water 10 cc.—for from 5 to 20 minutes or more.

(3) The blue-stained sections washed with water.

(4) Placed for one-half minute to one minute in saturated solution of picric acid.

(5) After washing, the sections were placed in 70 per cent. solution of alcohol, changing them so as to differentiate the tissues for fixing the pigmentation.

(6) Dehydrated in 96 per cent. solution of alcohol, made transparent with xylol, and imbedded in balsam.

In examining the specimens which were prepared by the above-described methods under the microscope, we observe many deep brown fibrils and branches in the yellow basis substance. Under a very strong magnification it is noticed that thionin precipitates, as is seen in Fig. 32, with a granular appearance not only in the dentinal fibrils but in the dentinal tubules. The fibrillar substances which stained out with thionin are no doubt the dentinal tubules or their branches. So that this staining method is not suitable for solving the problem regarding the relation between the dentinal fibrils and dentinal tubules.

(To be continued.)

A Study of the Dynamics Involved in the Etiology of Malocclusion.

By J. G. LANE, D.D.S., Philadelphia, Pa.

(Read at the annual meeting of the Eastern Association of Graduates of the Angle School of Orthodontia, New York, May 5, 1916.)

THE presentation of this paper is an attempt to show how far and wherein purely dynamic principles and processes are responsible for the occurrence, formation, and recurrence of malocclusions. We have had the etiology of malocclusion discussed almost all the way from the moment of segmentation of the ovum to bottle-feeding and heredity; also we have been told that rhachitis has caused practically all the malocclusions extant. At the present time we believe it wise and pertinent to bring the subject "down out of the clouds," and see if we cannot arrive at some logical conclusion concerning much of the etiology of malocclusion, and something that can be shown to be a real causative factor.

FORCES WHICH DETERMINE THE SHAPE OF THE DENTAL ARCH.

Let us first consider the conditions which have to do with shaping dental arches "just as they grow." Any dental arch takes a shape that follows a mean along the line of least resistance between the forces within the mouth and those outside of the mouth. The only factor we need consider as being directly a formative one inside the mouth cavity is the tongue. The theories and beliefs of many of our operators that a varying air-pressure or "partial vacuum" pressure is a factor continuously at work within the mouth cavity, which assists in shaping dental arches, are delusions. Air is not present under either positive or negative pressure, the air-pressure within the air-passages and mouth being identical with the pressure on the outside of the face. We therefore dismiss the partial vacuum theory as being no factor at all, dynamic or otherwise.

The formative force operating on the outside of the dental arches is brought about by the muscles of the face. Let us, then, for a moment consider no other force or factor engaged in shaping the dental arches; we will have, as stated, the dental arches located on a mean which is somewhere between the forces within the mouth and those from the outside.

Now let us recall the fact that there are many other sources of force which have to do with the formation of the dental arches. Only a few months ago we had the broad statement made in one of our meetings that childhood habits—or, to be more specific, thumb-sucking—amounted to nothing as a factor or cause of malocclusions and misshapen dental arches. The fallacy of such a statement or belief is so patent as to be obvious to the merest novice. Assuming that dental arches will and do form along the line of least resistance, as previously stated, then anything that is introduced as an additional force and distributed unequally over the area involved, or in prescribed locations only, must certainly determine a different location for the line of least resistance—hence a new determining factor, and because of it, a different shape of arch.

THE INFLUENCE OF HABITS.

With the introduction of the thumb or finger into the mouth, the various lip, cheek, and tongue muscles thus being made to perform a new and abnormal function, all the forces which should be normally present are perverted, and dental arches shaped in accordance with the demands of such perverted forces are the logical result which must be expected—and they certainly do obtain.

Each and every one of the various pernicious habits which involve the mouth or any part of it during childhood will cause its typical form of malocclusion or shape of dental arches. This is entirely because of the perversion of the normal forces and the introduction of new ones—purely a matter of dynamics.

MOUTH-BREATHING.

If mouth-breathing is present from any cause, usually adenoids, the tongue is not in its normal position, *i.e.* flat against the roof of the mouth. Being out of its normal position, the possibility of its assisting in the formation of the dental arches is *nil,* and no formative factor remains for the lingual sides of the upper teeth. When the mouth is open there is just a little tension on the buccinator muscles. This slight negative pressure, added to the lack of positive pressure that should be supplied by the lateral edges of the tongue, is sufficient to prevent the upper dental arch from growing as wide as would obtain if all forces were normal. The anterior portion of the upper dental arch has no restraining medium present when the mouth is open. Normally the lower lip covers the incisal one-third of the labial surfaces of the upper incisors; the upper lip covers the remaining two-thirds of the upper front teeth; thus the lips, and more particularly the lower lip, constitute the restraining medium which prevents protrusion of the upper front teeth. With the mouth held open, neither lip can perform this function, and so no restraint is offered to the front of the upper dental arch. But, as we have stated, a restraint is offered on the sides of the arch through the medium of the buccinator muscles, with no resistance afforded by the tongue. Under such conditions an upper dental arch could not be expected to be other than long and narrow—and we find it so.

When the mouth is held open—and we use the expression "held open" advisedly—the muscles which perform this function are not so located that their pull is directly downward; instead, they pull distally. Small as this force is, we believe it adequate to retard the forward growth of the mandible to an extent sufficient to be the principal factor in causing the class II case which is almost invariably present with the rest of the conditions we have just enumerated as sequelæ of the open-mouth condition.

ADENOIDS NOT A DIRECT CAUSE OF MALOCCLUSION.

Adenoids are only indirectly responsible for malocclusion; they have to do their work through some other medium, viz, a disturbance or perversion of the forces which have to do with shaping the dental arches.

Class III malocclusions invariably have a history of bad throat conditions. An hypertrophied tonsil is in no way connected with the mandible or maxilla as a formative medium of the dental arches; yet we find with every class III case a throat that is or has been in trouble. Enlarged tonsils are not in position to exert any force upon the teeth or their transitory supporting tissues, and therefore, *per se,* cannot cause a class III case.

INFLUENCE OF THE TONGUE IN PRODUCING MALOCCLUSION.

Hypertrophied tonsils reduce the air-passages in the isthmus of the fauces on account of their size. The posterior wall of the pharynx is unyielding, the cervical vertebræ, with their anterior spinous processes, being immediately under that surface. The lateral sides of the air-channel are bounded by the tonsils, which if enlarged reduce the air-space between them, and the anterior side is bounded by the base of the tongue. This latter is the only one of the four sides of the air-passage in question that is composed of a tissue subject to voluntary movement—which movement consists in moving the base of the tongue forward. If the base of the tongue is moved forward, necessarily the entire organ is involved; nor is the forward movement directly forward, but downward and forward. The tongue, in its effort to thus move away from the fauces, carries along the teeth of the lower jaw, with the transitory supporting tissues, by its force. Or, in very young subjects, the tissue of least resistance may not be the transitory alveolar process; it may be the mandible, and the force may induce an excessive growth of the bone, or cause a radical change in its shape. This change of shape and size of the mandible is much more liable to occur fairly early in life, or while the bone is still growing. Similar conditions later in life affect the transitory tissues more. A tongue that has thus been overworked by an abnormal function is usually too large, and because of its increased size must have more space. This is effected by yielding of the surrounding tissues to pressure of the organ, and the space thus made is lateral and forward. We can thus see that every dynamic requirement is present for causing a class III case.

It will be noted that the general conditions of environment present for producing a class III case do not necessarily include an open mouth or mouth-breathing, although in extreme class III cases the mouth cannot be easily closed. This, however, is a sequel and not a cause.

It does not necessarily obtain that dental arches in proximity to a throat having hypertrophied tonsils will develop into a class III case of malocclusion. With a fairly normal occlusion and interdigitation of cusps, and having a secure overbite, the dynamic forces thus embodied may overbalance the dynamic forces at work trying to cause a class III case. The result is the "survival of the fittest."

PERVERSION OF FORMATIVE FORCES THE DIRECT CAUSE OF MALOCCLUSION.

Any condition which will retard growth of the face and the supporting tissues of the teeth will be an indirect means of reducing malocclusion, the direct means involved being the perversion of the various formative forces due to insufficient size and capacity. In such instances the entire area and environments are likely to be undersized, with the exception of the teeth themselves.

It must be remembered that the teeth when first erupted are as large as they ever will be. They are the first tissues of the entire human economy to acquire adult size. At the age of, say, eight years a child has adult incisors in position; the face and head have by no means attained adult size at that age. The workings of nature will, if unhampered, produce the necessary rapid growth of the jaws to accommodate these teeth when they erupt. At the age mentioned the mouth region of a face that has within it a normal development of teeth, dental arches, and their supporting tissues, will look too large for the rest of the face. This is, however, a part of nature's plan, and unless it be present, crowding of the erupting teeth will result. In the event of insufficient growth, the erupting teeth must glide over each other, or overlap, or perhaps not succeed in growing into position at all.

Teeth erupting under such conditions will form a dental arch that is too small to accommodate all the teeth in normal approximal contact. The face, jaws, cheeks, lips, and tongue, all being too small, locate the line of least resistance in an arch that is exactly suited to every part of the environment except the teeth, and these are adult in size. The result is obvious; the last teeth to erupt have insufficient space, and a malocclusion results—simple dynamics. Any one or several of a myriad of causes might be responsible for this lack of growth. We need not enumerate them; the result is practically the same from any or all, or any combination of them.

This day and age of enlightenment in the science of orthodontia finds us all a unit in the belief that almost any infinitesimal force will move a tooth; finds us a unit on the theories of bone growth or rearrangement; a unit on the use of light and delicate apparatus for the purpose of moving teeth. We have found that teeth move more comfortably and successfully under a mild pressure than under a heavy one. We have also been brought to realize that a force of any kind derived from any source or cause, whether from an orthodontic appliance or not, will cause the teeth to change their positions; also that teeth will not move unless some force is applied to provide the necessary stimulus to excite the genetic function of the cellular elements involved.

PREDETERMINING THE SHAPE OF THE DENTAL ARCH.

Conversely, any orthodontic operation that places dental arches or individual teeth in a position not in harmony with the line of least resistance among the various forces that are always present is a failure. The question for us is, not what we "can do," but what will "stay done." We know that we can do almost anything in repositioning the teeth, but this prowess amounts to nothing if the result of our work is not permanent. We cannot hope to successfully disregard any of the forces present in the adjacent tissues and over which we have no control, any more than we can disregard any of the forces embodied in an orthodontic appliance.

If the large teeth of a small boy of, say, thirteen years of age be moved into normal occlusion, they will stay thus only so long as retainers are kept on, or until the boy's face has grown to a size of which the large teeth are an index. It is impossible to devise arbitrarily, by any means, a predetermined shape of arch from measurements of a few teeth as an index, and without regard to the general environment. It is utter folly to give a nice boot-heel shape to dental arches that are covered by a narrow face. Such correction is sure to go wrong because of not being in harmony with the forces that shape dental arches for such a face. Conversely, shaping a narrow arch for a wide face results in the same kind of failure.

Professor Hrdlicka explained to us at our last meeting that the shape of the dental arches was in no way dependent upon the cephalic index. Whether he is correct or not in this is not the question at present, but we do know that the shape of dental arches is dependent upon the general width and shape of the face, and that there is little or no harmony between the shape of the face and the cephalic index.

CONCLUSIONS.

The points intended to be brought out in this paper are—That all forces, of whatever origin, must be regarded; that malocclusion is a direct result of dynamics, from whatever cause; that the correction of malocclusion must be primarily a dynamic proposition, and that the questions of histology, embryology, anatomy, art, etc., are secondary; that the result of our efforts must be in conformity with the dynamics involved in the general environment, and over which we have no control; that the success of our labors is embodied in the one word "permanence," and that permanence of results can only be expected and achieved by a proper regard for harmony of dynamics.

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[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

Dentistry in the Canadian Militia.

By WALLACE SECCOMBE, D.D.S., Toronto, Canada,
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(Read before the meeting of the Buffalo Dental Society, held under the auspices of the Preparedness League of American Dentists, September 1916.)

THE word that most nearly describes modern military organization is efficiency. In striving for efficiency in the fighting forces a scientific study of motion is made, with a view to the elimination of waste time and energy. Modern methods of drill are the result. One hears much, in these days, of war equipment and mechanism, guns and ammunition; but, after all, the determining factor in war remains the same, namely, the human element. Wars are won or lost, armies meet ultimate success or failure, depending, in the final analysis, upon the physical condition and mental attitude of the troops. It is this personal element that makes "right" might. Thus the standard of efficiency is applied to the individual soldier as well as to the organization and equipment of the army. The successful army officer attaches the greatest importance to the morale of his men, and never fails to arrange for their comfort, happiness, and contentment, in order that good physical, mental, and moral conditions may be maintained.

In the modern army, separate corps or branches are organized to give special care and attention to the personal needs of the men. The Army Service Corps looks after food and transportation, and the Ordnance sees to clothing and equipment; the Army Medical Corps attends to camp hygiene and to the sick and wounded.

IMPORTANCE OF DENTISTRY IN THE ARMY.

In addressing the members of this society it is unnecessary for me to dwell at length upon the importance of dental service in maintaining the health and comfort of the individual soldier. The army dentist is now looked upon by military authorities as absolutely essential to the militia. The importance of the civilian dentist to the general public is generally recognized and appreciated, and in comparison the army dentist is vastly more important to the soldier in time of war.

Permit me to refer briefly to a few of the reasons why the dentist is of outstanding importance to the army. The life and health of the average soldier is of more value to the state in time of war than that of the average civilian. There is greater demand for dental services in the militia than there is among a corresponding number of civilians, owing to the varying conditions of climate, exposure, and diet to which the soldier is exposed, and which render him more susceptible to dental pain and disease. When a soldier is incapacitated through any cause, the fighting forces of the army are not only lowered to that extent, but the sick man, instead of being a help, becomes an actual burden because of the attention necessary upon the part of others in nursing him back to health. There is also in trench warfare a greater frequency of injury about the face and jaws, making the presence of the dental surgeon advisable in a comparatively large percentage of the cases requiring surgical treatment.

If further argument were necessary, one might refer to the terrific bombardments and sustained artillery duels characteristic of present-day warfare, with the resulting strain upon the nervous system, and the consequent necessity for keeping the modern soldier in the best possible condition of health. In passing, it is interesting to note in this connection that Rosenow has recently shown that local dental foci of infection may produce not only lesions of the digestive and circulatory systems, but also many different affections of the nervous system.

IMPERATIVE NEED OF THE BEST SERVICE.

The absolute need for adequate dental service in the army is beyond question: that this service must be the most efficient possible is also beyond question. The problem facing the authorities and the dental profession, therefore, is, How are dental services in the army to be organized so that the highest degree of efficiency may be obtained? You are already familiar with conditions as they obtain in the United States. The organization of the Preparedness League of American Dentists would seem to indicate that the dental profession in this country is not entirely satisfied that the present dental service in the United States militia is all that it might be or that it should be.

In Great Britain the general position and status of dentistry is unsatisfactory. We are not surprised, therefore, to learn that the British dentist does not occupy that position in the imperial army to which the importance of his work entitles him. As a matter of fact, the status of the army dentist in any country may be taken as a fairly accurate criterion of the standing that the dental profession has attained in that particular community. The difficulty in England appears to be that dentistry is organized as a part of the medical profession. Certificates of license to practice dentistry are issued by the General Medical Council of Great Britain, and the question is frequently asked whether this relationship does not, in a large measure, account for the position of dentistry in Great Britain today.

The attitude of the British authorities toward the army dentist is shown by the fact that dentists are employed to perform dental service under the army contract system. General commanding officers are empowered to spend money on the soldiers' teeth to fit their commands for active service. This system may be satisfactory in the purchase of clothing or accoutrement, but certainly does not provide for continuous or efficient dental service. British dentists, though registered by the Medical Council, were not exempted from military service under the Conscription act, as were the medical practitioners. Reports indicate that the British dentist works in the British army without either adequate status or efficient organization, and under the direct control of the medical officers.

ESTABLISHMENT OF A SEPARATE DENTAL UNIT IN THE CANADIAN ARMY.

In Canada we have progressed to the extent of organizing a separate and distinct army dental unit. The Canadian Army Dental Corps was organized in the spring of 1915, or about a year and a half ago. Previous to that time, Canadian dental surgeons were attached to the Army Medical Corps; they held honorary rank only, and seldom advanced beyond the rank of lieutenant. The dental surgeon and his work were frequently treated by the medical corps as of minor military importance—as a fifth wheel to the cart. The dental profession in Canada was dissatisfied with the conditions that obtained, as resulting neither in an efficient service nor one calculated to attract the best men of the dental profession to this important work.

Some men, uninitiated into military ways and usages, may be idealistic enough to say, "Service, after all, is the really big thing; why worry about rank?" However, after a short period of active service, such men begin to realize that the importance of their army work is usually judged by their rank, and open their eyes and ask themselves why they, as dentists, should accept lower rank and receive less pay than officers of other corps who certainly do not work any harder or render greater service than they.

The status of dentistry in the militia was brought to the attention of the minister of militia, Hon. Sir Sam Hughes, by a committee representing the Canadian Dental Association. Sir Sam was most sympathetic toward the establishment of a separate dental unit, its organization and work to be supervised and controlled by dental officers. The only doubt in the mind of the minister was whether or not in the treatment of certain conditions in the oral cavity there would be conflict of authority or opinion between the surgeon and the dentist. It was suggested to the minister that certain cases could best be treated by the surgeon and the dentist working in co-operation, and that there would be no more danger of conflict between these officers working in separate corps than there now is between physicians, surgeons, and dentists working in separate professions in civil practice. It was also pointed out that in Canada, as in the United States, the medical and dental professions are organized and administered entirely independent of each other, and that there exists a perfectly clear understanding as to the legitimate field of each; also there is a growing tendency upon the part of the two professions to co-operate in every possible way.

The Hon. Sir Sam Hughes is a man of action, and having been convinced of the advisability of forming a dental unit independent of the medical corps, decided forthwith to form the Canadian Army Dental Corps, and announced that the corps would be organized upon precisely the same basis as the medical corps, and that equal and corresponding rank to that in the medical corps would prevail.

There are always those who oppose any new movement, not with sane or logical reasons, but simply because the new condition disturbs the gentle slumbers of their pet fetish—*status quo*. It was to be expected that the ideas of these red-tape advocates would receive some rude twists in the adjustment of duties and prerogatives incident to the establishment of a new corps in the militia. Unfortunately for the dental corps, the Canadian deputy minister of militia is one of those members of the medical profession who has seemed to be rather prejudiced in favor of retaining army dentistry under the wing of army medicine. The early difficulties encountered by the dental unit only had the effect of developing a splendid *esprit de corps* among the members of the dental corps. Every member determined to make the corps a complete success, and worked with energy and enthusiasm, absolutely forgetful of self, to the end that efficient dental service might be rendered the Canadian soldier.

When the establishment of the Canadian Army Dental Corps was announced, it was found to be far short of what the profession had been led to expect. Some disappointment prevailed regarding both the matter of rank and the class of operations permitted under the regulations. However, the principle of a separate corps was officially recognized, and that in itself was a long step forward.

Under the original establishment of the dental corps the only operations permitted were extraction and filling. These limitations were no doubt due to the old dental requirements for recruits. These occasioned the rejection of men requiring artificial dentures. It was soon found, however, both in Great Britain and Canada, that the condition of the teeth of the present generation demanded a revision of the dental entrance requirements. This revision has now progressed to the place where a recruit's teeth are given nothing but a cursory examination. Indeed, the recruit is accepted even though edentulous. If otherwise fit he is turned over to the dental corps for treatment. Consequently new regulations have been passed permitting the army dental surgeon to perform practically every kind of dental operation required.

RANK OF MEMBERS OF THE DENTAL CORPS.

The original establishment of the corps (April 1915) was—

	Rank
Chief Dental Officer	Lieut.-col.
Senior Dental Officer in each division	Major
Officers with Field Ambulances and Hospitals	Captain
Other Officers	Lieut.

Dental Surgeons:
2 to each infantry brigade
1 " " artillery brigade
1 " " field ambulance
1 " " other unit of the division
1 " " brigade mounted rifles
1 " " field hospital
1 " " base hospital
1 " " base stores

A supplementary establishment was announced in March 1916 which provided for an increase in the dental corps of thirty-nine officers, including a headquarters staff:

Headquarters staff: Director dental services, 1 adjutant, 1 research officer, 2 officers at headquarters, London, Eng.; 1 quartermaster, 1 asst. quartermaster, 1 sergeant major, 1 quartermaster sergeant, 3 clerks.

At corps headquarters:

Dental Surgeons:
4 each infantry brigade (inst. of 2)
2 " for service corps troops
2 " artillery brigade (inst. of 1)
1 " advance stores
1 " casualty clearing station
1 " general hospital
1 " stationary hospital
2 " for remaining units (inst. of 1)
Research officer, with rank of Major.

A further establishment has recently been announced which has given the corps still better status, and makes its work more efficient—Order No. 287:

Establishment for Home Service—Canadian Expeditionary Force, for Service in Canada.

Militia headquarters:

1 Director dental services, rank Lieut-col.
1 Assistant
1 Quartermaster
1 Clerk
1 Stenographer
1 Quartermaster sergeant
1 Sergeant mechanical dentist
1 Batman

Military districts:

1 Assistant director dental services for each military district, and available for camps of instruction, with rank of Major.
1 Quartermaster
1 Quartermaster sergeant
1 Clerk
1 Batman

Battalion establishment: Add to the establishment of each battalion C. E. F.:

1 Dental surgeon
1 N. C. O. assistant
1 Batman

Officers appointed to home battalions to have the rank of Captain if they have practiced their profession more than two years; if under two years, the rank of Lieutenant.

Other units:

1 Dental surgeon per artillery brigade
1 " " field ambulance
1 " " stationary hosp'l
1 " " general hospital
Each with one N. C. O. and batman

The profession is looking forward with confidence to the further progress of the Canadian Army Dental Corps. The present attitude of the authorities is shown by recent orders which announced the appointment of Capt. George Gow, base hospital Salonika, and Capt. Guy Hume, base hospital Orpington—both members of the dental corps and formerly in practice in Toronto—each to the rank of lieutenant-col. Though all our men in similar positions have not received this rank, we are hopeful that future orders will provide similar rank to others.

The dental corps was not long organized before complaints were heard regarding inadequacy of equipment and supplies. Members of the corps who had left dental offices with modern equipment found themselves under the necessity of working with instruments and equipment considered by the government as composed of all essentials, yet found by these men to be inadequate in rendering the best service. There seemed to be a necessity for a fund, supported by the dental profession, upon which the corps might draw to supply those little extras —one might almost say those little luxuries—which by constant use in the office had come to be regarded by members of the corps as actual necessities. A sum amounting to between $3000 and $4000 was readily subscribed by the profession for this purpose, to be dispensed in the interest of the corps.

The question also arose as to the availability of Red Cross supplies to members of the dental corps. After some little correspondence it was decided by the Red Cross Society that dental surgeons might requisition supplies from any Red Cross depot. This was an important ruling.

OPPORTUNITY FOR "PREPAREDNESS LEAGUE."

It is necessary in countries such as Canada and the United States—where large standing armies are not maintained but where volunteer armies are largely relied upon—to recruit a vast number of men quickly at the outbreak of hostilities. Without adequate dental service, thousands of recruits are necessarily rejected because of the condition of their teeth—recruits who are otherwise fit. In your Preparedness League of American Dentists you have an organization that may be placed at the disposal of both the army dentists and the authorities in case of emergency. The dentists of Buffalo have occasion to feel proud of the fact that this excellent movement has received its impetus from the foresight and energy of members of your own society. In case of emergency the league will no doubt be of inestimable value; but back of it there should be a dental corps so efficient and so well organized that dental service may be supplied automatically as battalions are formed—that the recruits made fit by the League may receive continuous and permanent attention. The Preparedness League of American Dentists might also render great service in directing the study of war oral surgery—and this the writer understands, from Dr. J. Wright Beach, the chairman of the organization, to be the expressed intention of the League.

Allow me to recite a few facts concerning the Canadian Army Dental Corps. The corps is composed of over 200 graduate dentists, 80 undergraduates, and a total strength of over 500 members of all ranks. The members of the corps are distributed, and dental clinics are in operation in Canada from Vancouver to Halifax, and overseas in Greece, France, and England. Everywhere the corps is overwhelmed by the hundreds of patients presenting themselves each day for treatment. The presence of members of the corps immediately back of the lines has overcome the necessity for invaliding many men back to the bases to have their dental needs met. Thus has serious economic loss been avoided.

WORK DONE OVERSEAS IN THE CANADIAN EXPEDITIONARY FORCE.

The total number of dental operations performed in England and overseas from July 15, 1915, to June 30, 1916, is as follows:

Fillings	128,583
Treatments	23,471
Dentures	17,786
Prophylaxis	15,107
Extractions	102,743
Devitalizations	16,422
	304,112

The foregoing total is quite independent of operations performed throughout the several camps in the Dominion of Canada. In military district No. 2 alone, over 10,000 recruits have been made fit who would otherwise have been rejected because of the condition of their teeth. The question naturally suggests itself, If the condition of the teeth has for years been considered by military authorities of sufficient importance to cause the rejection of a recruit, is army dentistry not of sufficient importance to demand a separate and distinct unit in which the greatest possible efficiency may prevail? It has been frequently said that an army fights on its stomach and teeth. If that be so, then let us give the boys something to fight on!

The establishment of a dental corps

upon precisely the same basis as that of the medical corps is but the deserved recognition of modern dentistry and its relation to the health problem. We may consider such recognition as an honor to dentistry, but we must not overlook the accompanying responsibilities. We must see that the dental corps "makes good," and that the interests of the better men of the profession are enlisted in its behalf.

269 College st.

Plate Prosthesis.

By NELVILLE S. HOFF, D.D.S., Ann Arbor, Mich.

(Read before the Connecticut State Dental Association, June 13, 1916.)

FOR the present purpose we shall make no extended statement of the history of plate prosthesis, except in a few words to show by contrast the present situation and emphasize the conclusions we have in view.

Oriental prosthetic dentistry of uncertain date is characterized by the examples that have come to us in the form of plates carved from boxwood with shells for facings and nails for molar cusps, and Egyptian and Etruscan bridge work are fair samples of primitive efforts of the earliest western civilizations. It is notable that these efforts show a cleverness of design and execution that has not been so much improved by modern thought and effort as we are inclined to believe. Much of the present prosthesis is, in fact, lacking in the painstaking efforts characteristic of these earliest productions.

In tracing this art through the years to the present time, we discover many new forms and decided evidences of genius in invention, but are disappointed that there has not been a corresponding improvement in technical skill. In fact, we see so much that discredits this phase of our subject that we are inclined to believe we have technically degenerated in the later years. In view of the fact that in most departments we have continually striven to better our technique, we can only conclude that our skilled technicians are either slighting this important work or are delegating it to the untrained. It is a well-known fact that most of our best practitioners have devoted their best thought and efforts to conservative operations, while delegating restorative dentistry to less skilful employees, or, as at present seems to be the custom, permitting their patients to patronize the advertising quack or the commercial laboratories, most of which are conducted for revenue only.

TENDENCY OF THE PROFESSION TOWARD ELIMINATION OF PLATE PROSTHESIS.

It manifestly would be unfair for us to say that our profession is now less clever in invention, or that there is a positive tendency to undervalue the important function of plate prosthesis. We are forced, however, to believe that there is an increasing tendency on the part of our better-equipped practitioners either to decline this service or to delegate it to the incompetent. Perhaps it may not be true that our better men are doing this deliberately, but the evidence seems to indicate that there is a positive movement toward the elimination of this service from most of the better practices. We cannot feel that conservative dentistry or even prophylactic efforts should, for the present at least, supplant this most important branch of service. The good health and comfort of our old people is certainly a matter of concern to us all, and we can do much for them by well-adapted prosthetic dentures—in spite of the fact that a few years ago a newspaper man wrote a ridiculous article calling attention to the fact that old people should not wear artificial teeth because they were likely to overeat, and that nature had wisely deprived them of their teeth as a measure of protection. He tried to incriminate our profession as engaging in a bad practice for selfish purposes! Now this of course is not the reason why the dental profession, *en masse,* is not giving a due proportion of attention to this intensely practical subject. We are inclined to believe it is due largely to a lack of appreciation of the importance of the matter, or it may be to the idea that most professional men seem to have that it is their privilege to elect what line of practice they will undertake. Whatever may be the cause, we are reasonably sure that plate prosthesis is being sadly neglected by the better men in the profession, much to our shame.

INCREASING DEMAND FOR PLATE PROSTHESIS.

That there is a larger demand for plate prosthesis at the present time than ever before is indicated by the fact that more porcelain teeth are being made and sold by the dealers today than ever before. Whether this comes from the fact that there are more people than before, we of course cannot say, but at any rate we do know that there has not been a corresponding increase in the number of dentists, consequently more dentists should be interested in supplying the needs of these patients. As a matter of fact, those who have taken the trouble to investigate this matter tell us that most dentists are giving their attention to the operative phases of practice and referring their prosthetic practice to specialists or to the commercial laboratories. If this statement needs confirmation, make a little inquiry of your professional neighbors and friends as to how many dentures they construct each year, and ask your dental supply houses who are buying porcelain teeth for dentures. We are confident such an investigation will show that the commercial laboratory is constructing a large share of the dentures supplied by the better dentists in the larger towns and cities of our country.

The recent propaganda by the medical profession to fix the responsibility for many systemic disorders on diseased teeth is resulting in an almost criminal campaign of exterminating mouth infection by the extraction of all diseased and suspicious teeth. We recently visited one of the largest and best known sanitariums in this country, and learned that it was becoming an almost constant practice to extract all the teeth of patients suffering with certain ailments which did not readily respond to the usual treatment. If this practice becomes general with the medical profession our people are liable to become edentulous, and if so, we shall be compelled to give more attention than we now do to the problem of supplying them with scientifically constructed substitutes. Fortunately, the fundamental principles of plate prosthesis are fairly well worked out, and such men as Williams, Gysi, and others are busily engaged in working out the scientific and art data that can be utilized by our skilful technicians and clinical students to elevate this service to a place of proper and dignified professional practice; *provided we can be made to understand* the necessity for giving to this branch of professional service the same thoughtful and skilful attention we are giving to other departments.

There is a growing sentiment that too much time and thought are being given to crown and bridge work; at least, the present practice of mutilating and devitalizing good healthy teeth in order that support or attachment may be had for bridges, is being questioned very generally. It is probably true that much of this criticism is unjustly made by those who see possibilities of the creation of dangerous foci of infection because of imperfect manipulation on the part of the dentist, and there undoubtedly is more faulty root-canal work done by careless and indifferent operators than ever before.

PARTIAL DENTURES AS SUBSTITUTES FOR BRIDGE WORK.

If it should finally develop that less bridge work should be placed in the mouth there will necessarily have to be some substitute which will restore the crippled dentures to adequate function. At present we know of nothing but partial dentures which can take the place of bridge work. In fact, most of the so-called removable bridge work is partial plate work with mechanical retention. If this is to be the new order, shall we be able to turn this kind of service over to the office-boy or the commercial laboratory, and be justified when judged by professional standards?

We hardly see how the dental profession can solve this problem by delegating it to the mechanician, or how, as a profession, we can escape the destiny that impends by delegating to the unskilled what seems to be one of the most important functions of the dentist. If bridge work is to be restricted in its application, and we are to justify the high ideals we claim for our profession, we shall be forced to merit the confidence, not only of our patients, but of the educated and acutely discriminating medical men. In fact, it looks very much as though we shall not only have to make a renewed effort to perfect our technical methods, but we must study the sanitary and artistic problems involved until we shall have developed a scientific basis of practice that can stand the test of the strictest investigation from every quarter. I am aware that this is a large task, one that probably will not be accomplished easily or quickly, but it is a worthy aim for our best endeavors, and if the dental profession undertakes it in the proper spirit, there certainly will be a basis of practice developed that will result in better service to our patients than we have been accustomed to render, and our reward for a truly professional and skilful service will be the lifting of this branch of our work from the sphere of mechanical arts to that of a dignified and respected calling.

NECESSITY FOR BETTER SERVICE IN PLATE PROSTHESIS.

What may be done to make this branch of service more efficient? In the first place, we need as a profession to get a higher conception of the value of plate prosthesis. We must be convinced that our patients need adequate if not complete restoration of the function of mastication much more than we have ever thought. If we could, for instance, realize that our patients need properly masticated food for the nourishment of their bodies just as much as they need pure air in sufficient quantity for the support of respiration and blood aeration, we should perhaps get a better idea of the importance of our calling than many of us seem to have. We hear a great deal today about "efficiency." It seems to be useful in about every department of human endeavor except in the development of our bodies into typical physical mechanisms and their preservation through a period of natural existence in a state of good health. It sometimes seems that the business of the physician and dentist is to extricate humanity from the consequences of improper living, and that there is small hope for any different program in the near future. If this is our immediate and probable work for the future, does it not seem that we should become as efficient as possible in this rescue work? And again, since the dental profession does not seem to have grasped with any considerable force the idea that artificial dentures are an absolute necessity for mutilated and destroyed dental arches, is not some professional agitation necessary, to impress the importance of this fact on the dentist so that he may in turn educate his patients? If the dentist and patient both can be made intelligent on this question, there can be little doubt that patients will demand and dentists will be prepared to render adequate service in this most important field of practice.

We shall not have time here to further enlarge upon the importance and practicability of this suggestion, but we believe this to be one of the most vital questions that confront us today. It is being forced upon us not because of our own initiative, but because of the fact that the public is becoming intelligent about good health, and is asking for help from the dentist; and our medical *confrères* expect us to do our part intelligently. Shall we be equal to it?

DEMANDS UPON THE DENTIST FROM THE MEDICAL PROFESSION AND THE PUBLIC.

An appeal to duty does not always meet with ready response, for many reasons. We become so perfunctory in the practice of our profession from the force of routine effort, that we do not cultivate the habit of considering our work in what has been termed "the large." It will take a real revival of enthusiasm to reconvert most of us to the open mind, as we are so apt to be content with doing well enough. There seem to be signs that we shall very soon be called upon in no uncertain voice to make good our claims to being a scientific profession and a branch of the healing art. Today we enforce the traditions of the past, but tomorrow we may be called upon to give the reasons for our practices, and we shall be expected to make good in the light of modern experience and scientific knowledge. What seems to be needed is more knowledge and a considerable improvement in the artistic and technical treatment given our patients.

It will be said that the fees prevailing are so inadequate that no dentist can afford to equip himself scientifically and artistically to enable him to serve on so exalted a basis of practice. This, as everyone knows, is an excuse and not a reason. The prevailing fees are not arbitrarily fixed by any responsible authority in this country, as is the case in Germany. The dentist who earns a fee—not a price—can always demand and obtain from a patient whom he has adequately served a reasonable compensation, providing he has the good judgment and skill to convince his patient that the value is in the service.

To my mind the first great step in meeting this situation will be the establishment of a strong professional conviction of the importance of better plate prosthesis. We are compelled to confess that this is a most unpromising ideal, and one most likely to be realized only because of compulsion from the medical profession and those whom we serve. If this comes to pass, we shall be compelled to give our best endeavors to it, which naturally will result in a better technical service than we now render. Would it not, however, seem more creditable that we be saved the humiliation of having another incident forced upon us by the medical profession like the demonstration of systemic infection from unsanitary oral conditions? If we are already convinced that we should give more attention to plate prosthesis, because of its great influence in preserving the health of our patients, then our plea is for a more critical study of our resources in materials and methods of adaptation. In the past ten years much study and excellent work have been done on the problems involved in plate prosthesis. The teeth have been immensely improved in form; methods of impression taking have been studied to great advantage, and we have practically mastered a technique for this important operation; methods of bite-taking and articulation of teeth for accurate occlusion have been worked out to a practicable degree of precision; mechanical attachments to secure more constant adhesion have been devised that are satisfactory and easily adjusted. Gold and aluminum cast metal plates have assumed an importance that will force every up-to-date practitioner to use them.

We cannot take your time to detail all or any great proportion of the newer and better methods of plate prosthesis. But to keep faith with our criticism and by way of illustration, we shall make some comments that perhaps may make the adaptation of the findings of the newer researches seem so simple as to bring their execution within the possibilities of the man of average technical ability. In doing this we do not pretend to bring any new ideas, but rather to suggest that more emphasis be placed upon some of the usual methods, with the idea always in mind that our processes, in the main, are scientifically correct, but that our technical treatments need much revision and improvement that they may be more efficient.

May we take a little more of your time to describe in some detail some of the more important technical procedures?

IMPRESSION TAKING.

The first step in all prosthetic procedures is that the most practicable impression be secured with the materials at our command. We are fortunate in this respect in that we have available several impression materials that will meet the requirements of the most difficult cases when used either singly or in combination with each other. We are also fortunate in the fact that in the past few years much attention has been given to the development of a better technique in the use of these materials. There is, however, an almost lamentable failure on the part of the profession in general to qualify as experts in impression taking. Our bridge and inlay workers have learned that success in their work depends wholly on exactness, and they have perfected their impression methods to meet the requirements; but it is almost ludicrous and sometimes pitiful to witness the impressions upon which the vast majority of dentists are satisfied to risk the best interests of their patients in plate prosthesis. There is no more important service the dentist is called upon to render than the adaptation of plate dentures, and there is probably no service more difficult to render satisfactorily, and yet it is the one service we are willing to slight if we do it ourselves, and one which we are willing to trust to almost anyone who will do it the cheapest. The general procedure is for the dentist to take a modeling compound or plaster impression and a "mash bite," and send these to a commercial laboratory with a sample tooth for shade and shape, and get by return mail a finished plate with a bill for two dollars and fifty cents. This may be a somewhat exaggerated statement, but it illustrates the idea we are endeavoring to present. If the first steps in the technical procedure of this service are not given careful consideration, how can we expect any others to be any better executed, even though the best laboratory expert available may have charge of these subsequent procedures? Nowhere in the realm of our art is so much carelessness tolerated.

We hope to illustrate in tomorrow's clinic a better technique, and one which is easily within the ability of anyone who will take the pains to develop it.

CONSIDERATION OF THE TISSUES INVOLVED.

The general practitioner who cannot make a complete diagnosis and adequately administer the chair part, at least, of every denture service is not offering one of the most needed services, and is failing as a general practitioner. The gum tissues in many cases of badly adapted dentures are chronically inflamed and liable to easily give way to bacterial infection, and we have a strong suspicion that badly fitting and uncleaned dentures are constant sources of much oral microbic development. We have all seen cases where vulcanite plates have been worn for twenty years and where apparently the adhesion was entirely satisfactory, but if these plates are removed from the mouth for a few days, they will not adhere at all. This is because in use the oral structures relax and adapt themselves to the badly fitting denture, and as time goes on the gum tissues become permanently adapted to the plate.

In our judgment, dentures should be exactly adapted to the gum tissues when in a *normal* state, and consequently should be refitted at frequent intervals, depending on the oral conditions, which should be carefully inspected to discover changes from the normal, especially when these changes show a tendency toward active pathologic conditions. No denture should be worn for a long period of years, even though the patient is confident that he can eat everything he wants. It is not difficult to secure adhesion where the gum tissues are so soft that they will readily adapt themselves to the surface of the denture, and give adhesion by capillary attraction and the displacement of air or the oral fluids Dentists do not give that critical attention they should to the gum manifestation in the mouths of patients who are wearing old or ill-fitting dentures. All mouths with gum tissue debilitated from wearing dentures should be given a period of rest and treatment, depending on the extent of the pathologic manifestations.

ADAPTABILITY OF THE VARIOUS MATERIALS TO IMPRESSION TAKING.

The impression should be taken with materials that will compress the swollen tissues to as near the normal as is possible, so that when the new denture is made it will support these soft or flabby tissues mechanically in a nearly normal condition, until resorption and resolution have taken place from the trophic changes which always follow normal stimulation. For this condition, we know of no better material for impressions than beeswax. Plaster is too fluid when used in a workable condition to produce the desirable compression, and modeling compound will continue to flow as long as it is at all adaptable and appreciable pressure is being maintained. Wax is more cohesive, and is workable at such temperatures that considerable pressure is required to produce flowage. Wax does not produce as sharp detail as plaster or compound, and yet if properly manipulated it will secure accurate form in all cases where there are no decided undercuts or overhanging ledges. It is peculiarly adapted to all cases where there is much alveolar absorption and soft or encroaching soft tissues. If more detail is desired, a thin mix of quick-setting plaster spread over a properly trimmed and carved wax impression will give not only correct form but also accurate detail. In fact, we have had the greatest satisfaction in impression taking with a combination of wax and plaster, not only in edentulous cases without undercuts, but also in cases having decided irregularities of form, and even in partial cases where the teeth were in very irregular alignment.

This method is not for the careless operator, but requires a skilled technician to use it successfully. It is not, however, so difficult a method but that any reasonably expert operator can use it successfully. It is no more difficult than the securing of a good wax pattern from a well-prepared complicated cavity in a tooth. We, however, are not contending strenuously for this particular impression method, but feel that successful plate prosthesis demands a better and more accurate technique than the vast majority of dentists seem to think requisite, and present this as an illustration of the contention we are making.

PLACING THE TEETH ON THE MODELS.

Another technical procedure that is badly done and one which needs a great deal of improvement is the adjustment of the teeth on the models in their proper positions in order to secure proper anatomic relations and physiologic functions. At all times we have realized that comparatively few dentists have the artistic ideals that enable them to arrange teeth in such form that they will not actually deform their patients and discredit the prosthetic art, but it is not so generally recognized that very few full-plate dentures are so harmoniously articulated as to make the functions of mastication and speech practicable.

A great deal of study and work has been done by our eminent teachers and students as to the nature of the mandibular movements. We have invented articulating frames of both simple and exceedingly complex forms to put into effect the results of these researches. In spite of all this work we find that few practitioners have mastered these findings and are putting the results into practical use. They will not buy and use the Gysi articulating frame, or any other good anatomical articulator, but are satisfied to let the laboratory man mount their "mash bite" in a "plain line" articulator, and let it go at that. If they are asked why they do not use the Twentieth Century articulating frame, the Snow face-bow, and the plate bite, they will reply that they are too complicated for them to take the time to acquire the necessary technique.

The methods of bite-taking and adjustment of bites on the articulating frames are really very simple; anyone with a reasonable amount of skill can apply all the principles so far developed by a simple and easily acquired technique, and there is no good reason why we should not all adopt these more scientific methods of bite-taking. It may perhaps be that the exhaustive writings by our workers have confused the main thought so much that the "busy" dentist thinks it too scientific and technical for him to master, and so he clings to his old methods.

TECHNIQUE OF TAKING THE "PLATE BITE."

Taking the plate bite for a full upper and lower denture is easily done by placing on the models stiffened wax base-plates, or metal or vulcanite base-plates if these are first made, and building on the lower base-plate first a sufficient amount of softened beeswax to make a full "mash bite" giving the distance between the upper and lower jaws. Before removing this from the mouth, mark the height of the lower lip when the lips are just occluding; this will give the incisal surface of the lower front teeth. Remove the bite from the mouth and place it on the upper and lower models; then mark in the wax bite the occlusal surfaces of the second molar position on both sides, and draw a line on the buccal surface of the wax bite from the molar mark, through the incisal mark, to the molar mark on the opposite side. This will indicate the complete occlusal surface line. This can be made straight, or the anatomic curves may be established if one knows approximately what they should be in such cases. With a hot knife cut the bite into two pieces on the line of occlusion thus determined. Separate the upper and lower and place the lower wax on its model. Trim the buccal surfaces of the wax to the proper contour, being careful to locate exactly the position of the line of occlusion of the buccal cusps of the molars and bicuspids and of the incisal surfaces of the anterior teeth.

This line should be located as nearly over the apex of the alveolar process as possible, except of course that irregularities of form should not be followed, but a properly shaped arch should be produced. This will give a properly contoured lower bite. All excess wax on the lingual side should be removed, and the bite reduced to the size and proportions required for the lower denture. It should be made perfectly smooth, so that when placed in the patient's mouth it will be comfortable, and allow free movements of the tongue, lips, etc., without the denture being appreciably disturbed or interfering with articulation. Softened wax is then placed on the upper bite-plate so that it adheres and is in approximate quantity and form for the upper bite. The lower bite is placed in cold water to harden it, and its occlusal surface lubricated with vaselin or soap to prevent adhesion. Both waxes are then placed in the mouth, and the patient asked to "bite on the back teeth" very slowly. Do not permit complete occlusion the first time, but remove the upper bite and carve away the surplus wax; lubricate its surface again to prevent adhesion, replace in the mouth, and ask the patient to again "close the teeth gently." Then ask him to move the jaw backward and forward and sidewise until he rubs the bite surfaces to complete contact in all positions.

By watching the various positions taken by the bites as the patient moves them over each other, it will be easy to determine the proper position for the rest bite, and at the same time the occlusal surfaces and anatomic curves will be established in accord with the condyle path and rotation centers. The bites are then marked for the rest position, the face-bow adapted, and the bite removed for adjustment on the articulator. If the bite has been carefully taken and the right occlusal surfaces obtained, it is not necessary to pay any attention to the condyle path or rotation centers, except to adjust the condyle path of the articulator to correspond with the anatomic curves made in the wax bite.

The teeth can then be placed in position by removing the upper wax bite and making a new base-plate for the upper model, or if a metal or vulcanite base-plate has been used, by removing the wax from the base-plate and setting all the upper teeth first to the lower wax bite, observing contour and anatomic curves. Then remove the lower bite and make a new lower base-plate and set the lower teeth to the upper, observing articular and occlusal relations. In placing the upper teeth do not place them in actual approximal contact, but by allowing slight spacing there will be room for sufficient subsequent lateral adjustment to make more perfect occlusal relations of the cusps.

After the teeth are all placed, correct any errors of alignment, being particular to secure balancing relations, artistic form of the arches, and position over the arches that will not throw undue leverage on the teeth when brought into any position of occlusion. Then release entirely the vertical adjustment support screw and adjust the occlusal relations. When this has been done the dentures are ready for test trial in the patient's mouth. Here enough time should be taken to correct faulty articular relations, and also for the correction of occlusal faults.

Lastly, the artistic appearance of the dentures should be carefully studied—and it is surprising how much can be done by changing the positions of the anterior teeth slightly while in the patient's mouth. A little grinding of the contours or a slight change of the shade or perhaps an irregularity may be introduced that is very effective; the introduction of a gold filling is sometimes effective, but in our judgment is not often in good taste.

The subsequent steps of construction are highly important, but are largely technical, and are not necessary for the purpose of this paper. What we have in mind to develop in this discussion is that plate prosthesis is a much more important professional service than we are accustomed to believe, to call attention to the fact that it is fast degenerating into a lost art, and worst of all, that it is becoming a perfunctory, mechanical, or commercial service. There is a very strong current of reaction against crown and bridge work, and some other conservative practices, just now. The attitude of the medical profession in strongly urging the removal of all suspiciously diseased teeth is likely to result in a tremendous increase in the demand for prosthetic restorations of the plate variety, and the problem before us is, "How shall the profession meet this demand in the most efficient manner?" It seems to us that it will be to our disgrace if we do not meet this new issue professionally, rather than to permit its solution to rest with the advertising dentist or the commercial laboratory.

1905 Cambridge Road.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

The Radiograph in Diagnosis.

By CHARLES C. VOELKER, D.D.S., Brooklyn, N. Y.

THE wave of excitement, amounting almost to hysteria, which passed over the dental and medical professions a couple of years ago, when the relationship often existing between foci of infection in the mouth and dyscrasias in other parts of the body became more generally recognized, has largely spent itself. The orgy of extraction which this phenomenon carried in its train has also abated. But it is apparent that teeth are still consigned to the forceps at times by medical men and dentists—often through the insistence of patients who have been frightened by some of the pseudo-scientific writings in the daily press and the popular magazines—simply on evidence furnished by a single radiograph showing a dark area at the apex of the root of a tooth.

EXAGGERATION OF THE SIGNIFICANCE OF THE "DARK AREA" IN RADIOGRAPHS.

The researches of Rosenow and others, which proved the correctness of the view already held by many careful diagnosticians in dentistry, that a close relationship exists many times between dental lesions and disease of parts remote from the mouth—combined with the introduction of radiographic outfits as indispensable adjuncts in the everyday armamentarium of the dentist—have doubtless been potent factors in helping to place dentistry on its present high plane. Yet the pendulum for a time threatened to swing too far in the direction of radicalism, and it seemed as though the whole category of human ills was to be traced to a common origin bearing the rather indefinite title of "blind abscess," the existence of which was often supposed to be definitely proved by the appearance on a radiographic film of the dark spot to which reference has been made.

Expert radiographers, those capable of taking the most perfect dental films and radiographic plates, are not of necessity good diagnosticians. In fact, they sometimes admit that they would prefer that the dentist referring cases to them for radiography would make his own diagnosis from such negatives, as well as from his knowledge of the mouth conditions, rather than render an opinion which might prove to be erroneous. "Post-mortems" of teeth recounted to the writer, in which the patient had the films on the evidence of which the teeth were extracted, as well as the extracted organs, have convinced him that some teeth, at least, could have been saved by careful modern root-canal treatment and the scaling operations which present-day methods for the treatment of pyorrhea alveolaris have proved to be efficient in bringing about a cure.

All dark areas at the apices of roots seen in a dental film are not necessarily to be designated areas of infection; nor do they, in my humble opinion, always indicate the presence of the apparently ubiquitous streptococcus viridans—whose viridity, by the way, as Dr. Frank Billings has lately stated, affords but a name, "but does not signify the pathogenic character or virulence; the type may even lose the property of green-color production on culture media."

This fact, combined with the other, that it has been shown to be a very common surface parasite of the mucous membrane of the mouth and tonsil—and further that it and its relatives, S. mitosis, S. fæcalis, and S. salivarius, are thought by some to be transition forms, or mutants, of the still more ubiquitous pneumococcus—reminds one of the old saying, that "A rose by any other name would smell as sweet."

MORE DEFINITE METHOD OF ANALYZING CULTURES FROM ROOT APICES NEEDED.

We still need some genius to develop for us a truly scientific method whereby the bacterial organisms surrounding an infected root apex can be analyzed from cultures taken directly from the infected region, *in situ* and *in vivo,* and free from the danger of error inherent in present-day technique. Experiments *in vitro* would then receive more consideration from the doubting Thomases. When such a faultless method shall have been developed, it will probably be found that some of the areas to which reference has been made—our "blind abscesses"—will be free from pathogenic organisms and are due to other causes which produce dark areas on dental radiographic films.

Speaking of the etiology of inflammation, Stengel* says: "Irritation by mechanical, chemical, thermal, or infectious agents causes inflammation when it is severe enough to disturb the vitality of the tissue and not sufficient to cause extensive necrosis at once. . . . The processes concerned in the healing of uninfected wounds and in other cases of injury unaccompanied by infection are . . . . truly inflammatory. It must be recognized that non-bacterial injuries to tissues liberate substances by cell destruction which are capable of producing the phenomena of inflammation. Among the causes of inflammation in this pathological sense must be included certain endogenous processes, notably of circulation, innervation, and metabolism, which cause local cellular degeneration, followed by exudation and reparative phenomena."

SOME POSSIBLE CAUSES FOR RAREFIED AREAS.

May not the rarefied areas sometimes seen on dental films be due to trauma, as when a tooth has become loosened slightly on account of undue stress upon it due to the force of occlusion or the placing of a clasp around it to help in the support of a partial denture; or to imperfectly regenerated bony tissue after curetment of an abscess cavity, or after the operation of apicoectomy?

In Fig. 1 there can be no doubt of the diagnosis. The tooth, although quite firmly held by the remains of the alveolus and the gum, was too badly affected by pyorrhea to be saved.

Fig. 1.

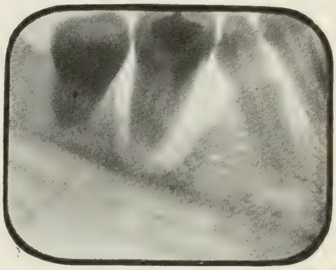

Fig. 2.

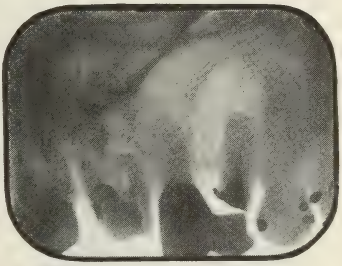

Fig. 3.

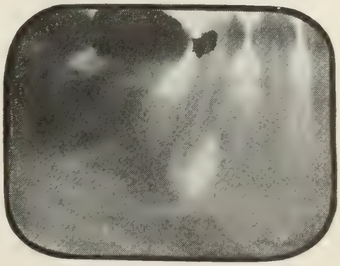

Fig. 2 shows a large area of infection on the root of a first bicuspid left under a piece of bridge work; also an infected area over the anterior buccal root of a badly broken-down first molar.

In Fig. 3 there can be no doubt of the diagnosis; even the sinus from the abscess shows clearly.

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* Stengel and Fox. "Text-book of Pathology," 1915.

Fig. 4 shows beginning degeneration at the apical ends of the upper left canine and first bicuspid, due to putrescent pulps, also a piece of root in the molar region, apparently encysted and doing no harm.

FIG. 4.

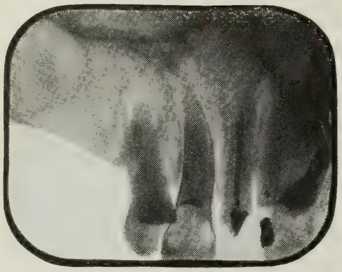


Fig. 5 shows slight areas over the undeveloped anterior upper teeth of a young woman of over sixteen years of age, whose teeth were being regulated. These teeth are perfectly healthy in every respect, and a radiograph taken three years later showed no change in the flattened appearance of the apices of these roots.

FIG. 5.

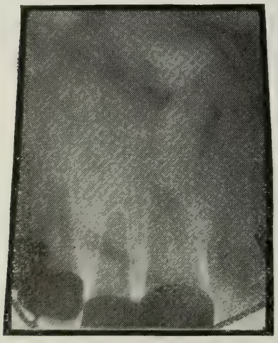


Fig. 6 was taken in an endeavor to locate the cause of intense pain on the upper left side, which the patient said had lasted nearly two months, during which time she had been to her dentist for treatment about every other day. The film shows pathological conditions in the peculiarly shaped exostosis of the root of the second bicuspid and the piece of tooth root between it and the second molar. Yet neither of these was the cause of the trouble. The pain, which had continued almost without cessation for about two months, was stopped in about fifteen minutes upon the discovery that a piece of inflamed pulp tissue existed in the first bicuspid, and its removal under conductive anesthesia by means of novocain according to the method advocated by Dr. Hermann Prinz.

FIG. 6.

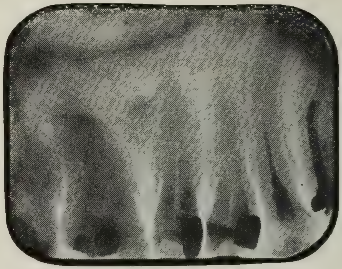
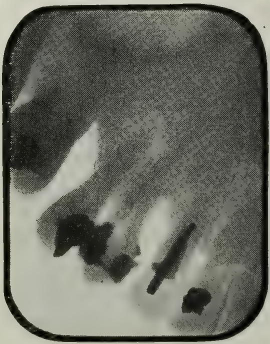


Fig. 7 shows a slight area over a root-apex, which was diagnosed as of infectious origin. In this case both the upper left bicuspids were infected. Compare this with Fig. 11, in which the same diagnosis proved to be incorrect.

FIG. 7.



In Fig. 8 the upper right first bicuspid shows a gold cap—with a hole—and an apparently healthy root. The patient complained of soreness in the tooth, although the crown had been in place for a good many years and had never given trouble. Examination of the tooth disclosed a pus pocket extending along the mesial surface of the root for quite a depth, probably induced by the irritation of the badly fitting cap. This was removed. The pulp was found vital and was devitalized. The tooth, however, remained quite sore after this treatment combined with a thorough scaling and treatment of the pyorrhea pocket, and the roots were not filled until two months later. The wires in the roots are shown in Fig. 9, and Fig. 10 shows the roots filled. No special effort was made to open through the apices in the endeavor to follow the teachings of some of our root-canal specialists. The apical openings were large enough naturally to allow the chloro-percha to overflow. Filling of the roots in this case caused another period of soreness in the tooth, and it was not until two months later, when the root had been perfectly comfortable for over a month, that a porcelain-faced crown was put on. During the whole course of the treatment of this tooth there was found nothing in the frequent radiographic examinations taken to aid in the diagnosis of the cause of the pain felt by the patient.

FIG. 8.

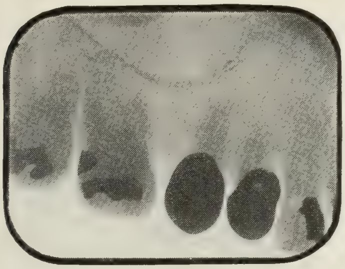


FIG. 9.

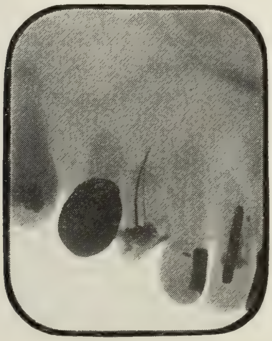
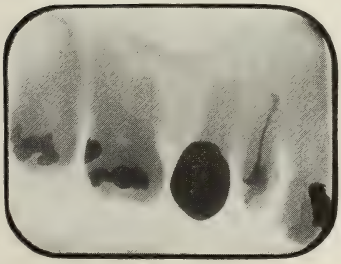


FIG. 10.



In Fig. 11 we have a small dark area over the upper right first bicuspid root, somewhat smaller than that in Fig. 7. The tooth presented broken off fairly short near the cervical margin, and had been used to support a gold clasp attached to a partial upper denture for a term of years. It was slightly loose in the socket. The patient experienced no pain whatever. After making the radiograph and diagnosing a dead and probably putrescent pulp, an opening was attempted into the pulp chamber, it being necessary first to cut through quite a layer of secondary dentin. Pain was experienced after proceeding a short distance. The diagnosis was immediately changed, and it was decided to use conductive anesthesia and open into the pulp chamber. Complete local anesthesia supervened after a very few minutes, using a one and one-half per cent. solution of novocain. No difficulty was

FIG. 11.

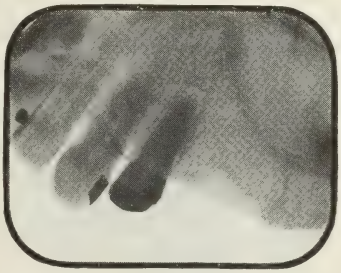


FIG. 12.

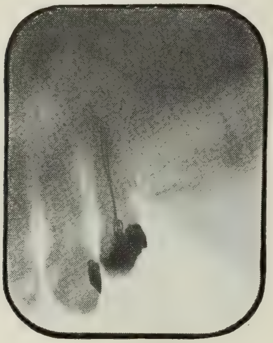
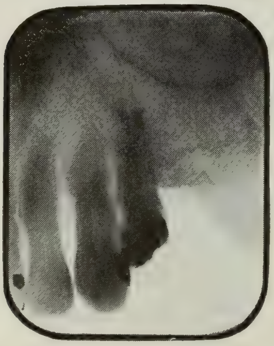


FIG. 13.



experienced in removing the pulp from both canals, each division of it being blanched white and apparently entirely healthy. After treatment, the tooth was radiographed the following day with wires in the canals, as shown in Fig. 12, and it will be noted that the dark area which was present the day before had entirely disappeared. Two days later the canals were filled, as shown in Fig. 13. Here again no special attempt was made to open through the apices, yet the liquid chloro-percha formed the mushroom-like knobs over the root-end.

CONCLUSIONS.

The radiograph is thus not an infallible guide in diagnosis. Yet it is an adjunct of great importance when combined with other methods of diagnosis at our command, and is indispensable in most cases. Yet dentists who are using this means of checking up their work on the root-canals of teeth, or who have much consultation practice, are becoming more conservative in advising the extraction of teeth which show dark areas on the film—unless such teeth are very badly diseased and there exists no doubt of the septic nature of the areas mentioned—even though the patient be suffering from any of the diseases which have recently been attributed to dental foci of infection. Such teeth can often be saved and put into a condition of health and usefulness by careful treatment.

The writer feels that, in all cases in which radiographs have been advised by the attending physician and diagnosed by the radiologist, such diagnosis should be confirmed by the dental adviser before final decision is reached regarding extraction.

Atypical Development in the Light of Correlative Variation.

By GEORGE E. DAWSON, Ph.D., Springfield, Mass.

(Read at the annual meeting of the Eastern Association of Graduates of the Angle School of Orthodontia, New York, May 5, 1916.)

THE subject of this paper requires, first of all, an exposition of its terms. Development is here used in its biological meaning of differentiation of organs and functions for necessary and specific ends. As thus used, development differs from growth, which means increase in size through multiplication and enlargement of cells, but does not necessarily involve specialization or adaptation for particular purposes. For example, the fingers of the hand, under their growth aspects, are large or small, as the case may be, while under their developmental aspects they are of various lengths, shapes, degrees of sensitiveness, and so forth, according to the functions which they perform. So, likewise, any other organ or set of organs may be regarded with reference to their size or to their fitness to perform more or less specialized functions.

RELATION BETWEEN GROWTH AND DEVELOPMENT.

In this way growth and development may not necessarily be parallel, although in the normal life such is the case. Thus there may be well grown but poorly developed hands, well grown but poorly developed features of the face and head, and a well grown but poorly developed organism as a whole. The same law undoubtedly holds in the psychical life. The automatisms, instincts, and intellectual factors may have bulk or quantity without having specialized adaptability or quality; thus the instincts of hunger, fear, anger, and so forth may be massive enough but lacking in refined adjustment to specific needs. Thus, too, perception, attention, memory, and so forth may be adequate in amount but more or less inadequate in their adaptability to the particular experiences with which a cultivated intelligence is occupied.

This distinction between growth and development is of the utmost importance in understanding the structures and functions of organisms. It is also of the utmost importance in the care and training of individuals, and in corrective treatment of any kind.

ATYPICAL DEVELOPMENT.

The term "atypical development" is here used to describe such deviations in structure or function as in any way defeat the specific and necessary ends of life. Whenever an organ or function of the body or mind is not adapted to serve the purpose for which nature intends it, such organ or function is atypical. Thus the eye is intended to relate the individual to the world of light, the ear to the world of sound, the tactile organs to the world of substance and form, and so forth. If, now, the eye, the ear, or the tactile organs are ineffectual in establishing normal relationships in these directions, they are atypical. The various instincts and intellectual functions are intended to effect such psychological relations with the world as will insure the survival of the individual. If an instinct is too weak or too strong, if a factor of the intellect is inadequate to give the requisite degree of consciousness, the mind itself is atypical. All structures and functions whatever are important as they affect the life advantageously or disadvantageously. Those that affect the life advantageously are typical; those that affect the life disadvantageously are atypical.

CORRELATIVE VARIATION.

By "correlative variation" is meant the tendency of organs and functions to appear in groups, related through some bond of structural or functional unity. Life is constantly undergoing modifications in the direction of development or degeneration, which modifications are never isolated. The individual organism is composed of living cells integrated into tissues, organs, and systems of organs in such a way that there is the closest interdependence throughout. Individual diseased cells must affect the tissue complex of which they are a part, as in the case of diseased epithelial cells, which in glandular and other tissues may give rise to cancer. Diseased tissues, furthermore, involve organs, and diseased organs involve the entire body. So that no single factor in the organic life, however small, can be modified without involving changes, first in structures closely related, and then increasingly in all the structures of the organism.

With this preliminary explanation as to the meaning of terms, we are now ready to consider certain propositions involved in our subject. And first, the development of life in the animal series everywhere reveals the law of correlative variation. As structures and functions have increased in complexity and perfection, all the various modifications have appeared in series of related groups. It will suffice for the purpose of this paper to note only a few of the more obvious illustrations of this law. Thus in insect life we find everywhere bilateral correlation of structures; legs, wings, and antennæ on the opposite sides of the body vary correlatively in size, form, number of joints, and the like. The color markings on the two wings and other details of pigmentation vary in a similar manner. This same bilateral correlation, indeed, extends throughout the whole range of animal development up to man himself. The lower and upper limbs, with their respective differentiations of fingers and toes, the vertebral processes, with ribs symmetrically attached, and the mammary structures, are all illustrations of the law of correlative variation. The development of the sense organs brings to light this same tendency of organs to appear in pairs; thus there are two eyes, two ears, and two nostrils, symmetrically placed and fashioned, even to the minutest details. In many of the higher animals, color variations show the same tendency to bilateral symmetry that is found among insects. The plumage on the two wings of birds, the stripes on the sides and limbs of various quadrupeds like the zebra, and the pigmentation of the eyes of all animals, including man, illustrate the law of correlative variation.

CORRELATIVE VARIATION IN MERISTIC STRUCTURES.

Not only are the variations of bilateral organs thus closely correlated. The same is true, though less obviously, of what are called meristic organs, that is, organs grouped symmetrically according to a certain pattern. The existence of patterns in organisms, determined in general by differences in function, is a central fact of morphology throughout the entire animal series. The various structures which compose these patterns are so related, structurally and functionally, that when one varies, the others vary with it. The organs of the head and face may be taken as an illustration of correlative variation of meristic structures. These organs constitute a pattern of structural and functional groups that have been created largely through nervous functions. In the evolution of the brain, in the animal series, certain changes have occurred which have carried with them modifications in the size and shape of the head and face. Thus, as the frontal lobes of the brain have increased in size, the proportions of the head have changed; the forehead has become higher, more perpendicular, and broader. This has involved changes in the shape of the face, which has developed from the prognathous type, or face with projecting jaws and receding forehead, to the orthognathous type, or face with vertical jaws and forehead. Correlated, furthermore, with these changes in the cranium and the facial index, is a complex of changes involving the nose, jaws, alveolar arches, palate, and teeth. In short, the entire group of organs at the cephalic end of the cerebro-spinal system has varied throughout the animal series, from the lowest vertebrates up to man, correlatively with the racial or phylogenetic development of the brain.

A more specific and obvious illustration of meristic variation may be seen in the hand. In the evolution of this organ certain relations between the various structures have been established. Thus the middle finger is the longest and the thumb is the shortest, with the other fingers graded between these extremes. There are likewise various differences in width, length, and form of the phalanges, lines on the palm and volar sides of the wrist and fingers. papillary tracings, and so forth. In general, as evolution has proceeded, the variations in all these details have become more specialized and refined, such variations appearing correlatively. In the human hand at the present time, if one element varies conspicuously, it will be found that the whole hand shows symmetrical modifications. Thus, if there is a very short or very long thumb, the fingers show similar proportions; if the joints of one finger have a certain ratio of length or breadth, the joints of the other fingers are constructed similarly; or if the lines or papillary tracings on one part of the hand show a certain depth and distinctness, those on homologous parts of the hand are likewise clearly defined. In brief, the entire hand has developed racially as a meristic group of structures, each detail of the pattern or symmetrical design varying correlatively with all the others.

EMBRYONIC DEVELOPMENT OF CELLULAR STRUCTURES.

Again, the evolution of the life of individuals reveals the same law of correlative variation. Early in embryonic development cellular structures are differentiated into three fundamental groups or layers—the epiblastic or outer layer, the hypoblastic or inner layer, and the mesoblastic or middle layer. Each of these layers becomes henceforth the origin and directive force in the development of the respective groups of structures. Thus the *epiblastic* layer of cells gives rise (1) to the epithelium of the outer surface of the body, including that of the conjunctiva and anterior surface of the cornea, the external auditory canal, together with the epithelial appendages of the skin, such as hair, nails, sebaceous and sweat glands—including the involuntary muscles of the latter; (2) the epithelium of the nasal tract, with its glands, as well as of the cavities communicating therewith; (3) the epithelium of the mouth and of the salivary and other glands opening into the oral cavity, and the enamel of the teeth; and (4) the tissues of the nervous system, the retina, the crystalline lens and probably part of the vitreous humor, the epithelium of the membranous labyrinth, and of the pituitary and pineal bodies. The *hypoblastic* layer of cells gives rise (1) to the epithelium of the digestive tract, with that of all glandular appendages excepting those portions which are of epiblastic origin at the beginning and termination of the tube; (2) the epithelium of the respiratory tract; (3) the epithelium of the urinary bladder and the urethra; and (4) the epithelium of the thyroid and thymus bodies. The *mesoblastic* layer of cells gives rise (1) to the connective tissues, including areolar tissue, tendon, cartilage, bone, and dentin of the teeth; (2) the muscular tissues, except that of the sweat glands and dilator pupillæ; (3) the tissues of the vascular and lymphatic systems, including their endothelium and circulating cells; (4) sexual glands and their passages; and (5) kidneys and ureters.

DEVELOPMENTAL RELATIONSHIP OF VARIOUS ORGANS OF THE BODY.

The organs derived from each of these layers of cells illustrate in greater or less detail the law of correlative variation. In embryonic development and in postnatal development the modifications of specific organs in either group in the direction of progress or retrogression are associated, structurally and functionally, with modifications of other organs in the same group. Thus in the epiblastic group of organs we find many striking examples of structural and functional perfection or imperfection involving related organs. The correlative variations in skin, hair, nails, and sebaceous and sweat glands, affecting such details as pigmentation and the various factors involved in the structural and functional peculiarities of individuals, are matters of popular knowledge. For example, everyone has noticed that the negro and the white man, as ethnological types, and the brunette and albino, as individual types, present different qualities correlated more or less according to variations within the group of epiblastic structures. That is to say, associated with the particular kind of skin possessed by each of these types, are certain peculiarities of hair, nails, sebaceous and sweat glands, and so forth. Well known also to scientific specialists are the correlative variations between the development of the nervous system and other structures of epiblastic origin. A well developed, vigorous brain is more likely to have associated with it a healthy skin, healthy sebaceous and sweat glands, healthy mucous membranes of the nasal tract, and normal auditory and visual organs, than is a poorly developed and feeble brain. Such a correlation between nervous and other epiblastic structures is one of the outstanding facts in the life of mental defectives. While these correlations may be dependent to some extent upon other causes, there can be no doubt that they are largely due to causes operating throughout the whole epiblastic group of structures.

But the correlative variations to be found within these groups of organs derived from the epiblastic, hypoblastic, and mesoblastic cells, respectively, supply only the basis of individual development. The farther we advance from the early stages of embryonic life, the more complex becomes the process of correlative variation through the increasingly close interaction among all the organs and functions of the entire life. So it is that other relationships between organs seem to be established which determine their resemblance to one another. Thus we find a close relationship between the digestive and the circulatory system, between the muscular and the skeletal system, and between the nervous and the glandular system, or between any one of these and each of the others. Out of these relationships grow common variational tendencies which link their respective organs together in the direction of general progress or retrogression. In this way a peculiarity of skeletal development, as affecting one of the limbs or the jaws, for instance, may have associated with it peculiarities of muscular development. The small-boned child or the child with asymmetrical organs has in general light muscles or asymmetrical muscular development. In this way, too, peculiarities of the digestive system may have associated with them peculiarities of the circulatory organs. A sluggish, debilitated digestive tract is apt to have associated with it degenerative processes of the arterial structures. In this way, finally, peculiarities of the glandular system may have associated with them peculiarities in the nervous development. Absence of the thyroid gland, or a diseased condition of that organ, is correlated with arrested nervous development or excessive functioning of the brain. The cretinous idiot on the one hand, and the neuropathic, excitable, adolescent girl on the other, are common illustrations of the relation between glandular and nervous variations.

CORRELATIVE STRUCTURAL AND FUNCTIONAL VARIATION.

A more specific and constant, though somewhat indirect expression of the law of correlative variation, is the correlative variation of structures and functions themselves. The structure of organs primarily conditions the functions they perform, but the functions performed constantly determine the character of the structures. Regarded from either point of view, therefore, the variations of structures and functions are reciprocal, and they progress or retrogress together. Thus the structures of the hand primarily determine what the hand can do; but what the hand does will affect its structures from infancy to maturity. The structures of the oral cavity primarily determine what the organs of the oral cavity can do, but what these organs do from infancy to maturity will affect the development of the oral structures; and so throughout the organic life—or, indeed, throughout the psychical life—there is an absolute correlation between structural and functional variation. This is one of the most practical aspects of our topic. No thorough understanding of either the structures or the functions of an organism is possible without taking into account both the structural and the functional aspects of the problem. Nor can any effective training or corrective treatment be devised without taking both of these aspects of the problem into account.

Atypical development, therefore, is to be considered in the light of correlative variation. Biological evolution, the development of the individual life, and the interdependence of structure and function, all afford cumulative evidence of this necessity. The scientific student of structural and functional variations in human beings, whether under their normal or their pathological aspects, should not fix his attention exclusively upon isolated organs and functions. Every organ and every function that organ performs are parts of a complex of structures and functions, and can be understood, correlated, or trained only in connection with all the rest. Defective eyesight cannot be fully understood or corrected merely by testing for myopia, astigmatism, esophoria or exophoria, and the prescription of lenses. Defective vision may be correlated with general lack of vitality, diseased condition of the teeth, neurasthenia, or even specific structural or functional disorders in the visual centers of the brain. Defective hearing cannot be fully understood or corrected merely by regarding the organ of hearing alone. Defective hearing may involve inflammatory conditions of the Eustachian tube, or may be the result of tonsillar infection, lowered vitality, neurasthenia, specific affections of the auditory centers in the brain, and other causes. Defective teeth cannot be understood and treated by oral diagnosis and mechanical appliances alone. These organs may involve arrests of skeletal development affecting the oral cavity, arrested or perverted function of the muscular system, systemic disorders growing out of impaired vital functions, or even arrested development of the brain.

DEFECTIVE ORAL CAVITIES ASSOCIATED WITH CRANIAL AND FACIAL ANOMALIES.

Without any pretense of speaking with authority on the anatomy and physiology of the mouth, and still less on the specific matters with which dentistry is immediately concerned, it may help me to make a more direct application of my subject at this point if I refer to certain correlations of oral defects with other organic defects that I have met with in my investigations of school children. What I shall say in this respect, however, will be illustrative and suggestive rather than exhaustive. Defective oral cavities are so commonly associated with cranial and facial anomalies in my experience that I have come to regard them as well-nigh invariable correlates of such anomalies. Thus, in general, the low cephalic index, say below 76, is usually associated with a short zygomatic diameter, narrow jaws, narrow and high palate, contracted alveolar arches, and crowded teeth. This is the head and face of the neurotic boy or girl, that is, the boy or girl more or less nervously unstable. On the other hand, the high cephalic index, say above

82, is usually associated with a long zygomatic diameter, wide jaws, a broad and rather low palate, free-flowing alveolar arches, and teeth roomily placed. This is the head and face of the rather moderately developed but stable nervous system. Between these two extremes come the head and face that have associated with them the various intermediate characteristics of oral structures. In other words, it is the neurotic type of nervous organization that, in my experience, presents more frequently the anomalies of contracted alveolar arches and crowded teeth.

ILLUSTRATIVE CASES.

(I) A girl of fifteen, with a mental age of six years:

(1) Exaggerated brachycephaly (0.90).
(2) Exaggerated zygomatic diameter.
(3) Lower jaw, left side, larger than right.
(4) Palate low, broad, with large ridge in center of vault.
(5) Left upper alveolar arch contracted.
(6) Teeth irregularly placed.

(II) A boy of fourteen, with a mental age of eight years:

(1) Exaggerated dolichocephaly (0.71).
(2) Short zygomatic diameter.
(3) Palate high and V-shaped.
(4) Teeth in upper jaw badly crowded.
(5) Nose undeveloped (adenoid growths).

(III) A girl of seven, with a mental age of three years:

(1) Exaggerated dolichocephaly.
(2) Short zygomatic diameter.
(3) High, V-shaped palate.
(4) Crowded teeth, upper incisors protruding.
(5) Upper jaw asymmetrical, left alveolar arch contracted and thickened.

(IV) A girl of eight, with a mental age of three years:

(1) Exaggerated dolichocephaly.
(2) Short zygomatic diameter.
(3) High, V-shaped palate, with contracted and thickened alveolar arch on side.
(4) Left side of head and face larger than right.
(5) Teeth crowded, some overlapping.

(V) A boy of fifteen, with a mental age of nine years:

(1) Exaggerated brachycephaly.
(2) Exaggerated zygomatic diameter.
(3) Right side of head larger than left.
(4) Right lower jaw larger than left.
(5) Palate low, with heavy ridges; alveolar arches contracted and thickened.
(6) Teeth irregularly placed.
(7) Epicanthus hypertrophied.

(VI) A girl of fifteen, with a mental age of eight years:

(1) Exaggerated brachycephaly (0.95)—hydrocephalic.
(2) Exaggerated zygomatic diameter.
(3) Saddle-shaped palate.
(4) Alveolar arch of upper jaw contracted and thickened irregularly.
(5) Teeth badly misplaced.

(VII) A boy of twelve, with a mental age of two years:

(1) Exaggerated brachycephaly (0.91).
(2) Platycephalic head (abnormally flattened at top).
(3) Exaggerated zygomatic diameter.
(4) Eyes placed obliquely (Mongolian).
(5) Right lower jaw larger than left.
(6) Palate saddle-shaped.
(7) Teeth badly misplaced.

Moreover, there are frequently correlated with these neurotic nervous systems, with their narrow jaws and palate and crowded teeth, a more or less imperfect development of the muscular system and weak alimentary organs. That is to say, nervous development or nervous drains, or both, have so far outstripped nutritive processes and muscular development that there has been produced a greater or less disequilibrium between fundamental organic processes and the nervous system, with its correlated organs of the head and face. This, it will be recalled, is what is likely to happen in the evolution of the cerebrospinal system in the race and in individuals, with the increase of cerebral development and the readjustment of the organs of the head and face that is rendered necessary. The boys and girls of this neurotic type are therefore in advance of the average of their fellows in nervous development, though showing frequent symptoms of cranial and facial degeneracy as well as nervous instability, muscular atrophy, and weak alimentary systems, the results of unequal distribution of developmental energy or of excessive dissipation of such energy because of defective nervous inhibition.

But there is another type of boys and girls that brings to light equally striking correlations of oral and other organic defects. This is the type of underdeveloped nervous organization such as is found in most mental defectives. The majority of the feeble-minded children and youth that I have examined have deformed alveolar arches, deformed palates, and irregularly placed teeth. Here the general characteristic is asymmetry. The alveolar arch is unduly thickened, usually more so at some points than at others, the palate is the so-called saddle-shaped palate, and the teeth are inclined to grow out of line or to be doubled. In short, there are just such anomalies as one would expect to find associated with asymmetrical heads, faces, ears, mouth, and so forth, the entire complex of structures being that of an organism whose nervous system is radically defective both in its trophic centers and in the centers of automatic and voluntary control that determine the activities upon which symmetrical organic development depends.

This under-developed, nervous type of children and youth—with their cranial and facial asymmetries and asymmetries of the oral cavity—is not the by-product of nervous evolution, as is the neurotic type. It is rather the by-product of nervous degeneration through racial and individual vices and dissipations. So frequently, indeed, are such children and youth the offspring of an alcoholic heredity, and sometimes of a parentage infected with venereal disease, that there can be little doubt that arrest of development and impairment of structures and functions at the very sources of life are the principal causes producing this type. Here are the arrested, infantile hands, feet, limbs, trunk, head, face, and so forth; here are the asymmetries of development in fingers, toes, arms, ears, nose, eyes, mouth, jaws, palate, teeth, tongue, and other organs—all such forms of arrested development, whether symmetrical or unsymmetrical, indicating a failure of energy in the fundamental organic and physical processes.

PRINCIPLES INVOLVED IN CORRECTIVE TREATMENT.

Thus regarding atypical development in the light of correlative variation, what general principles should guide us in our corrective treatment of defects? Obviously, we should seek to improve the whole complex of structures and functions with which the particular defect is related. There can be little hope of permanently remedying a defect or curing a disease so long as the organs correlated with the defective or diseased organ are impaired or perverted in their functions. Thus a defective sense organ, a defective limb, a defective respiratory, circulatory, muscular or nervous system, if susceptible at all to remedial treatment, can be permanently improved only through a remedial process general enough to include as wide a group of related organs as possible. Thus, too, if in the light of this general principle I may venture to speak of defective oral structures, a permanent improvement may be hoped for only in so far as corrective treatment is general as well as specific. A deformed alveolar arch, crowded teeth, defective occlusion, and the like, are not likely to be effectively corrected until nutritional processes, muscular and nervous functions, and even mental attitudes, are normally established. The correlation between structures and functions already referred to here supplies a thoroughly scientific guide in corrective treatment. Structural treatment having been provided according to the necessities of the case, every effort should be made to insure correct functioning of the organ. This is a matter of improved nutrition, adequate exercise of the neuro-muscular mechanism involved, the building-up of a correct mental attitude, and the formation of such physical and mental habits as will help permanently to establish normal functions and thus make the structural treatment effective.

To summarize and conclude this paper: Organic evolution reveals a tendency of structural variations to appear in groups or complexes of related organs. The development of individual forms of life reveals a similar tendency; this is true both of normal and of abnormal structures. Anomalies of the human organism, therefore, should be regarded in the light of this law of group-variation. The corrective treatment of such anomalies should involve the entire complex of structures and functions with which the anomalies are correlated. This involves, in reality, the entire organism, but it affects more immediately the closely related structures. In proportion as corrective treatment comprehends all the structures and functions of the related group will it be fundamentally and permanently effective.

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[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

The Influence of American Dentists upon Europe.

By N. S. JENKINS, D.D.S., New Haven, Conn.

(Read at the annual meeting of the Connecticut State Dental Association, New London, June 13, 1916.)

THE subject which I have chosen, in response to the flattering invitation of your committee to address this distinguished society, appears to me to be especially appropriate to the time.

The history of Europe, from the middle of the nineteenth century up to the outbreak of the world war in the second decade of the twentieth century, will presently become a sealed book. With the ending of this terrible conflict, all things in Europe, political and social, will become new. You of this generation will be confronted with other conditions, problems, hopes, and fears, amid which some knowledge of the influence our profession has had upon Europe in the period which has now passed away may be of interest and value.

I therefore venture to present to you some of my observations, professional and personal, during a period of residence in Europe for half a century.

The most important event which has thus far occurred in the history of dentistry was the founding of the Baltimore College of Dental Surgery in 1839. The little band of enthusiasts, headed by Hayden and Harris, could not be suppressed by lack of money or influence, or the indifference of the public and the scarcely concealed contempt of the medical profession. These men knew they had a mission to establish a school where dentistry could be taught as a specialty of medicine, and they had the true spirit of adventure which led them to take every risk and to make the most of their meager resources, oblivious of the scoffing crowd. This undertaking, desperate from the standpoint of pure reason, found quick response from dentists both in America and Europe, and soon other schools began to exist, multiplying and improving from one generation to another, until now dentists are being educated in palaces, by instructors of international renown, and under conditions which enable graduates to take their fitting place among men of science throughout the world.

The efficient practice of dentistry, then, as now, required a high standard of technical skill and resourcefulness. Owing to physical and social conditions, Americans have always shown a special aptitude and inventiveness in the mechanic arts, and these hereditary qualities gave them for a considerable time a superiority in the *practice* of dentistry. This was especially the case during the latter half of the last century, before European schools had been technically as well organized as were the American schools, and therefore it was not surprising that some American dentists, graduates of the early American colleges, were lured to European practice. It required in those days, before the civil war and before ocean greyhounds or cables, or American colonies in Europe, a certain spirit of adventure and of self-reliance for Americans to settle abroad; but the American dentists who went to Europe to practice in those years, and who established there the reputation of American dentistry, possessed these qualities in a high degree. It is therefore with a deep sense of gratitude and appreciation that I desire to speak of these early pioneers, whose talents and characters commanded the admiration and respect of us who followed them and of the people among whom they lived and wrought.

DR. FRANCIS PEABODY ABBOT.

The first of these eminent men whom I knew was Dr. Francis Peabody Abbot, the scion of a representative New England family. I had studied dentistry with the intention of settling abroad, and when, after graduation at Baltimore, I had had some three years of experience in practice, I corresponded with Dr. Abbot regarding a desirable location. He recommended Dresden, and consequently, as soon as the short war of 1866 was over, I sailed for Hamburg, and went to Berlin.

From the first moment of meeting with Dr. Abbot a friendship was formed which continued, in ever-increasing intimacy, for more than twenty years, and up to the time of his lamented decease. Had I been his own son he could not have shown me greater kindness. For some weeks I stayed in Berlin, daily learning something from him regarding the peculiarities of a European practice, being introduced to many of his patients and having the advantage of seeing all his methods of operating. It was purely an operative practice, and I could not too much admire the intelligence and the conscientiousness with which it was conducted, and the skill which obtained such marvels of conservation where only gold, or gold and tin, were used in filling the teeth. I saw patients from over half of Europe returning, sometimes after years of absence, having been treated before cohesive foil or the rubber dam or the dental engine had been dreamed of, with wonderful operations in perfect condition and showing no signs of secondary decay.

I wondered at the perfect control Abbot had over his practice, also that he should, as a matter of course, invite me to inspect his most important patients, and honor so young a man as I then was by asking advice regarding the treatment. This, however, occurred only after he had, in our earliest acquaintance, with great tact and courtesy induced me to explain my methods and had also seen me operate.

When at last I went to Dresden he gave me letters to important personages in the Saxon capital, and also wrote to his Dresden patients that they no longer need come to Berlin to be treated by him, but were to consult me.

These acts of kindness were, however, as I soon discovered, not exceptional, but the rule of his daily life, and I refer to them only that I may give you a clearer idea of a man sincere, fearless, generous, highminded, intellectual, just, and benevolent beyond measure, who adorned his profession and shed honor upon his country.

Abbot, during his whole career, stood indisputably at the head of his profession in northern Europe. No honest colleague, however humble in attainments, ever consulted him in vain. He was cast in too large a mold to take part in personal strife, but he rebuked selfishness and insincerity unflinchingly, yet withal so justly as to excite no feeling of resentment. His influence kept many a meaner soul loyal to noble thought and life, and set a standard of generous consideration for each other which made the relations of the colleagues of his day enduringly intimate, cordial, and helpful.

DR. WILLOUGHBY D. MILLER.

It was Abbot who first discovered and encouraged the genius of Miller. From the beginning of his friendship with that gifted young man he felt that he was needed in dentistry. After their intimacy had become close, the elder man broached the subject. The younger man listened respectfully, and promised to think it over. During the period of doubtful questioning, Abbot sent Miller to me for a visit of a week, at the expiration of which time I returned with him to Berlin, and on the way Miller told me of his perplexity. He said he felt he should devote himself to science, and he feared dentistry would offer too restricted a field for his ambition. I endeavored to dispel this fear, and it was interesting to see, in a few short years, how that field expanded under his researches to the enlightenment and blessing of the world.

But it was not through his intellectual gifts alone that Miller's influence became precious to Europe. Under any conditions he would anywhere have been one of the great men of his day, but in having the opportunity of being intimately associated with Abbot, especially after becoming his son-in-law through an ideal marriage with Miss Caroline Abbot, all that was naturally noble, generous, sincere, and considerate in Miller's nature flourished as freely as did his brilliant mental powers. He became the natural leader in European questions concerning dentistry, and had need of all his wisdom and kindliness to prevent these questions from being involved in futile personalities or narrow provincialism. Before the dawn of this century men were beginning to think and trying to act internationally, but there were few men who had the broad vision, the calm judgment, and the winning sympathy which characterized Miller, and which so well fitted him to play the rôle of guide, philosopher, and friend. His conscientious devotion to his duties was phenomenal. I remember with what emotion those members of the International Dental Federation who met at Amsterdam in August 1907 listened to the reading of a letter from Miller, written from his deathbed, giving elaborate and most valuable advice to the Federation, of which he was president, and offering excuses for his absence. We had already heard by cable of his untimely death.

Miller's personal influence was most profound in Europe, where his chief work had been done, but it is by an American that the most fitting tribute to his genius and his memory has been paid. Permit me to quote the concluding paragraph of the noble address of Kirk upon the unveiling of the Miller monument at the Ohio University—for it represents the sentiment of Europe as completely as that of America:

> He has left to us of his profession the heritage of a noble example and a legacy of scientific knowledge the effect of which has been to change the whole current and direction of our thought so definitely into the channels of a true professionalism that there can be no turning back. Each of us, therefore, in laying claim to our share in this rich endowment, can but review and renew his brilliant record, and in so doing acclaim our pride in the fact that such a life has been lived among us, has been shared by us; most of all, that it shall remain the perpetual inheritance of us all.

DR. ABBOT'S INFLUENCE UPON EUROPE IN A GENERAL WAY.

I cannot refrain from referring also to Abbot's influence upon Europe in a general way. He had a wide acquaintance among all classes of men, by whom his character and his opinions were held in high esteem. He was absolutely fearless in expressing his opinions, but they were so reasonable and sincere that they never caused offense.

At the outbreak of the civil war the sympathies of the governments and ruling classes in Europe were almost exclusively with the South. This was partly due to the influence of southern diplomatists and southern families resident abroad, but chiefly to the instinctive dislike with which monarchical governments regarded the western republic, the success of whose system of government could but, in the long run, be unfavorable to personal government.

From the first moment no one doubted where Abbot stood. His house became the rendezvous of all loyal American citizens. He sent a man to represent him in the American army. He frankly and calmly explained the cause of the war to many who but for him would not have known the truth. When American government bonds were offered for sale in Berlin he did much to make them popular investments, and to the great advantage of all who followed his advice and example. In his way he did what he could to boom these bonds, with the result that when the war of 1870 broke out, in the panic which occurred on the Berlin bourse, he lost not only his entire fortune but was nominally also involved in debt to a large amount.

Having some inkling of this disaster, I went to Berlin on the last train sent on the regular schedule before all trains were taken for mobilization, and found that Abbot had been able to return to Berlin only the day before, finding his financial ruin complete. His composure was wonderful. He said, "It doesn't matter. I began with nothing, and I can now begin all over again, even if I haven't money enough to buy the family dinner." When I begged him to let me share my bank account with him, he answered, "Impossible! My partner, Dr. Dumont, keeps my pot boiling, and I couldn't deprive him of the pleasure of helping me."

I went at once to see Dumont. He was a Belgian who had been a classmate of Abbot at Baltimore and who had joined him in Berlin after Abbot had made a success of the practice. Dumont had lost half of his fortune also in the panic, a serious trial to one of his thrifty race, but I found him in a state of spiritual exaltation. He said, "I am so glad I have not lost all! Abbot has been doing everything for me these many years, and now, for the first time, I can help him." I mention all this to show how Abbot was beloved by those who best knew him.

All his life long, Abbot had been a victim to distressing attacks of asthma, occurring with no premonition of their approach. To a man of his social nature this malady was a great trial, for he never could depend upon being able to keep any social engagement. Especially at night he suffered greatly, it being a rare event when he could sleep undisturbed through the whole night. Mrs. Abbot said after the death of her husband that during all the years of his married life she had never known him to speak an impatient word regarding his affliction.

The generation which knew Abbot in person has passed away, but the influence of his noble life and character remains a living force, sure to survive and to bless mankind, in ways which we may see or in ways we know not of, for generations yet to come.

DR. THOMAS W. EVANS.

Dr. Thomas W. Evans was another American whose influence upon the Europe of his day was especially pronounced. He was, at the time he went abroad, a very brilliant gold operator, and skilful in every branch of dentistry as it was then understood. He possessed an extraordinarily active and ingenious mind, and seemed always able to find as if by instinct the most practicable way to accomplish his purpose. In his immensely busy life he found time for whatever he wished to do, and the range of his professional activities was very great. He was among the first who successfully transplanted human teeth, and he experimented in vulcanizing rubber before the days of the Goodyear patent. He it was who rushed off to a neighboring jeweler and made with his own hands a cannula for the Emperor Frederick when the operation of tracheotomy was suddenly decided upon. He once told me that he believed that the disease—which may have changed the course of European history in causing the death of the second German emperor in the prime of his manhood—had its origin in certain ragged lower molar roots, which the august patient would not allow to be treated. In 1853 he contributed a paper to the *Dental News-Letter* upon "The Regulation of the Teeth," which showed that even at that early date he had a fairly clear conception of the principles now generally accepted by modern orthodontists, and that he applied them with great ingenuity in his practice.

He was deeply interested in the work of the Red Cross, being one of the early supporters of the United States Sanitary Commission. I saw him in Dresden during the Franco-German war, he having come to suggest exchange of wounded prisoners and other alleviations of the dread effects of war. Probably no other man in Europe could have executed this task so well. It was my privilege to tell him something of the considerate way in which the Saxons had treated their prisoners, for they still retained kindly memories of their alliance with France two generations before.

I venture to relate the incident of the Indian cranes that mysteriously wasted away and died in various zoölogical gardens in Europe, as illustrating the versatility of Evans' mind. He took some interest in ornithology, and determined to discover the reason why these birds did not thrive. He had some imported from India, and placed them in his own garden. Every morning he rose with the dawn, sat in a chair on the lawn, and patiently watched the feeding of these birds. At last he discovered that they possessed a distorted vision from their habit of feeding under water. They could only see their food obliquely, and so generally missed grasping with their long bills the food lying upon the ground. But he patiently taught them until they overcame this peculiarity of vision, and at last they learned even to catch food in the air when tossed to them.

Soon after arriving in Paris, Evans made the acquaintance of the prince President, and quickly learned to admire that remarkable man, whose character and whose romantic career naturally appealed to an ardent young American. At that time every American boy had read "Abbot's History of Napoleon," and looked upon the great emperor as a world hero. It was therefore natural that Evans should yield to the charm of the prince, who was then perhaps honestly deluded as to his mission.

The Third Napoleon was by nature at once a dreamer and a mystic, and by training a conspirator. The European peoples had been enslaved anew by the treaty of 1815. The revolution of 1848 had proved futile. Louis Napoleon had believed himself to be destined to save society through becoming the head of a democratic French empire, and then to renovate and to reconstruct distracted Europe. Evans remained always a loyal American, believing in republican institutions for America, but also capable of sincerely believing that an empire deriving its power from the people was an ideal government for France, and might be also for Europe in general. Shortly before his death he told me, "I am still an imperialist!"

DR. EVANS' INFLUENCE WITH THE IMPERIAL FAMILY OF FRANCE.

It was Evans who first introduced the future Empress Eugénie to Louis Napoleon when he was still president of the republic—a circumstance which they never forgot. The intimacy which continued between the imperial family and Evans was founded upon the affection he bore them, and upon the real esteem they had for his character. He was frankly independent in his opinions. In the crisis of the American civil war, when the sympathies of nearly all the monarchical governments and aristocratic classes in Europe were with the South, the French emperor seriously thought of recognizing the Confederacy. He asked Evans to go to America and to report to him the true condition, and when he returned the emperor was convinced of the unwisdom of his contemplated action through the clear representations and earnest personal entreaties which Evans made to him. No other American could at that critical moment have had so great an influence, and that influence was exercised as greatly in the interest of France as of America. For Evans was a man of clear vision, and knew not only what a misfortune such action would be for America, but also how perilous to the emperor, who was ruling over a nation whose natural sympathy was with the cause of liberty.

Evans came to know nearly all the sovereigns of Europe, many of whom became his friends. He was frequently with King Edward VII, who, especially as Prince of Wales, showed him much kindness. The prince knew Evans had promised his mother not to gamble at cards, and whenever any of the men in his set urged Evans to join them in a game he would say, "Let Evans alone; he has good reason for not playing."

There are few more dramatic events in history than that of the instinctive turning of the empress in the hour of her greatest need to Evans as the one friend whom she could completely trust. She escaped from the palace under cover of darkness, sought Evans at his house, where he, who had first presented her to her husband, became the first whose duty it was to tell her that the empire was no more. Then occurred the romantic flight, which was carefully planned by Evans in every detail, and by which he brought the deposed empress-regent safely to England.

When in 1873 the emperor lay dying at Chiselhurst, I thought of the words of Marc Antony:

> But yesterday the word of Cæsar might
> Have stood against the world: now lies he there,
> And none so poor to do him reverence!

But I subsequently learned that there was one to do him true reverence. Evans came to take final farewell, and the last words the grateful emperor said to him were, "Of all my friends, you are the only one who has always told me the truth."

Evans loved and honored his profession. He knew that through it he had gained fame and fortune. His desire to have his fortune contribute to the advance of his profession and to perpetuate his name has been most happily fulfilled in the establishment of the Evans Institute at the University of Pennsylvania.

HORACE WELLS.

Another American dentist, although he was but a short time abroad, had a sudden yet enduring and beneficent influence upon Europe. Horace Wells went to Europe in 1847, partly to seek health and partly to interest European surgeons in his immortal discovery. Brewster presented him to the Academy of Medicine, and he received from generous France recognition which had been denied him in his own country. Unfortunately Wells came to a tragic end after returning to America, before the news of all the honors conferred upon him could reach him.

In France, however, through Brewster and Evans—who was probably the first to suggest the use of liquefied nitrous oxid and to report experiments in that direction—and also through the eminent Professor Paul Bert, the knowledge of Wells' system of producing anesthesia became widely known and practiced.

In 1910 a monument was erected in Paris by the dentists of France in memory of Horace Wells, the discoverer of surgical anesthesia, and of his devoted French disciple, Paul Bert.

I have ventured to give you these familiar personal remembrances not only because of the eminence of the men to whom I have referred, but also because they illustrate the character and quality of the men of their time and of those who have succeeded them. There were, in those early days, besides Brewster, Evans, Abbot, Coffin, a few other worthy representatives of American dentistry in Europe. Upon the importance and extent of their influence time does not permit me to dwell.

Shortly after the close of the civil war, however, the influx of American dentists into Europe rapidly increased. Many of them were of exceptional ability, and all of them were capable and devoted to their calling. European dentistry could then hardly be said to exist, but as dental schools began to be founded, the counsel and aid of Americans as instructors and professors became frequent. I believe that all of these earlier schools owed much to the cordial co-operation of native American dentists in practice in Europe and of Europeans who had been educated in American schools. After the example of Abbot, many American dentists in the full tide of practice, but who had no talent for general instruction, found time to explain their methods to less experienced European colleagues, always with hearty good will. Those were the golden days of American practice in Europe, during which the relations between American and European dentists were mutually agreeable and cordial.

AMERICAN DENTAL SOCIETY OF EUROPE.

On July 4, 1873, the American Dental Society of Europe was founded at the Rigi, with Terry, Van Marter, Wright, Williams, and Field as officers, and this society soon came to include in its membership nearly all the native American dentists in Europe, as well as a choice number of European American graduates. The history of this useful society remains to be written, but the influence of its members, both professional and personal, was largely increased through the intimacy and community of interests which united them in an organization which was at once American and international.

No good American could be insensible to the charm of European life and the cordiality with which he was welcomed to his new home, nor fail to cultivate and reciprocate European friendliness. The American dentist had invariably an international *clientèle.* Coming from a country where caste was unknown, his social position and influence was entirely dependent upon his breeding and character. If he encountered prejudice, it was generally in his favor. He came to know many classes of men in various countries, and often received confidences which would have never been extended to a European. The men to whom I have particularly referred had unusual opportunity to exercise their gifts of mind and character to the advantage of their contemporaries; but many of their colleagues, less known to fame, have, in the same high spirit, upheld the best American traditions, and contributed in their own way greatly to the enlightenment and to the welfare of Europe.

You will naturally inquire, "Will these good influences continue?" The answer is that they can scarcely continue in the same relative degree and form.

The founding of so many first-class European dental institutes, graduating such a number of exceptionally well qualified dentists, reduces the demand and the necessity for foreign dental practitioners. The passing of restrictive laws regarding foreigners will also act as a deterrent. On the other hand, the conditions which have made American dentistry such a power for good in the world still endure. America is responding to the demand for the higher education of dentists by adopting, beginning in 1917, a four years' course in all the American university institutes. In the development of European discoveries, such as local anesthesia and radiography, she shows her characteristic genius for assimilation and improvement; and in the number of those who intelligently teach and practice dentistry, she also maintains her superiority.

But all prophecy is worse than futile in the presence of the most awful tragedy in the history of mankind. We only know that when this fearful strife is ended, the spirit of sympathy and affection and kindly service which men of our profession have exercised toward all European countries and peoples will be surpassed only by the ardent desire of all America to aid in helping afflicted Europe to find ground for eventual reconciliation and enduring peace.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

Artificial Restoration of Lost or Missing Tissues in Congenital Cleft Palate and Other Deformities of the Mouth.

By VETHAKE E. MITCHELL, D.D.S., New York, N. Y.

(Read at the annual meeting of the Susquehanna Dental Association of Pennsylvania, Scranton, Pa., May 18, 1916.)

WE shall first consider the treatment of congenital cleft palate, because this is the most difficult of all oral defects with which we have to contend. Perhaps this may explain why so little interest has been shown in this work by the dental profession; nevertheless it is our duty to take up these problems, and assist in their solution for the sake of humanity.

While we know this condition exists, yet from a scientific standpoint we know comparatively little as to its cause, which furnishes large room for investigation.

From my experience in this field, I have come to the conclusion that there are many of these unfortunate individuals who suffer because of the old antagonistic feeling between surgeon and dentist, where the welfare of the patient, not being fully considered, is necessarily sacrificed.

This unfortunate state of affairs is gradually giving way, and co-operation is bringing about better results. By "results" I mean the health and comfort of the cleft-palate patient, and improvement of the speech to the highest possible degree. I do not say *perfect* speech, because perfect speech is a difficult thing to define. Nevertheless, in the treatment of these patients it is our duty to labor until we have at least made it possible for them to associate and to converse with normal people without the defect being noticeable.

When this can be done surgically, by all means let us resort to operation. But in most cases there is a lack of tissue, which means that when operated upon a shortening of the uvula and a stretching of the soft palate results, which does not improve speech. In these cases a prosthetic restoration of the tissue undoubtedly gives better results.

CONSIDERATIONS FOR PROSTHETIC RESTORATIONS.

Let us consider for a moment the conditions in this class of deformities as they are presented to us. There are two reasons for attempting to correct this defect either surgically or mechanically —(1) the improvement of the general health, and (2) the improvement of the voice and speech.

Nature intended that we should have separate channels for the air we breathe and the food we eat. We know this is so because of the difference in the normal anatomical formation of these cavities. Provision is made in the nasal passages for the warming, moistening, and filtering of the air before it passes into the lungs. The oral cavity does not supply these requirements. On the other hand, the highly sensitive mucous lining of the nasal passages is most unsuitable for contact with the passage of the different foods. In cleft-palate cases some food necessarily passes through a part of the nasal passages, which food by its constant irritation produces a catarrhal condition of these tissues, and causes them to secrete a viscid mucus which contaminates the air breathed and the food eaten by these people.

But this is not all. These unfortunates are conscious that their defect is announced whenever they attempt to speak, and this has a deplorable effect upon their physical and mental development.

Fig. 1.

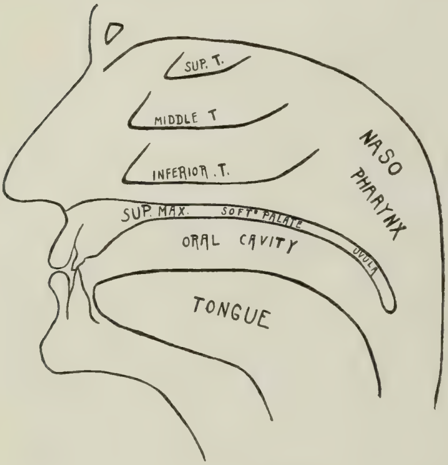
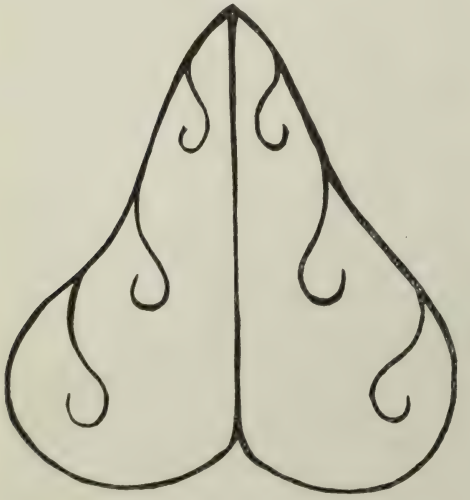


Fig. 2.

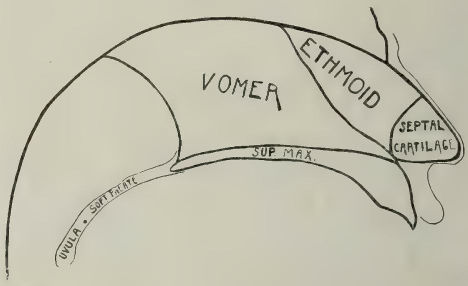


The palate is one of the most important organs of speech. Its functions are concerned in the forming of the tone of the voice by regulating the shape and size of the resonance chambers, and by closing off the nasal passages in the emission of certain sounds. This being impossible to a greater or less extent in cleft-palate cases, speech is very defective, and is characterized by that peculiar quality which all can recognize.

The velum, then, is not merely a curtain between the oral and nasal passages, but a very important part of the speech mechanism—an organ composed of many pairs of muscles, whose activities produce a variety of movements of the tissue.

Dr. Kingsley, in his work on "Oral Deformities," says: "Articulate speech is the result of certain definite sounds, the combination of different sounds, and the interruption to such sounds, which are by common consent associated with definite ideas, and thus express them. The voice as it issues from the larynx is modified in its tone and character by resonance in the buccal or nasal cavities separately, and in certain cases simultaneously by both. It is diverted or interrupted in its passage by certain organs with which it comes in contact, and thus an almost endless variety of tones and combinations of tones are created." To give a description of these muscles and their functions would consume too much time, and is not essential to this paper.

Fig. 3.



To understand more fully the tissues involved and their functions, I present several schematic drawings illustrating these points:

Fig. 1 shows the nasal cavities with the turbinate bones, superior, middle, and inferior, on either side, each form-

FIG. 4.

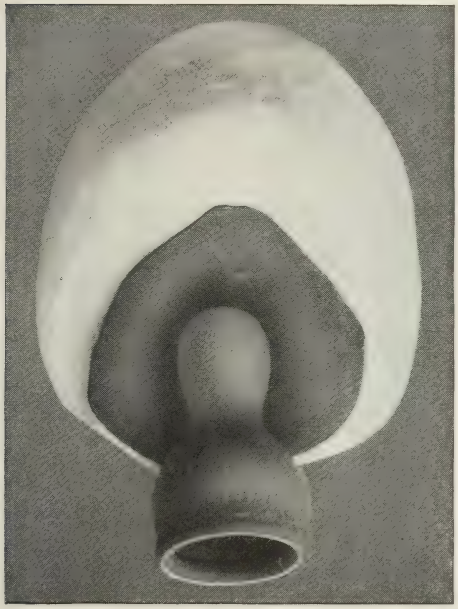
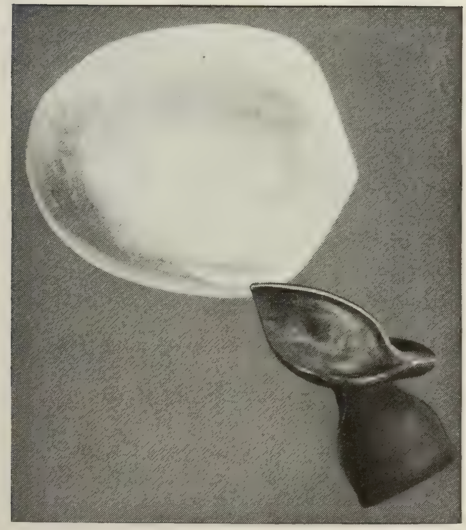


FIG. 5.



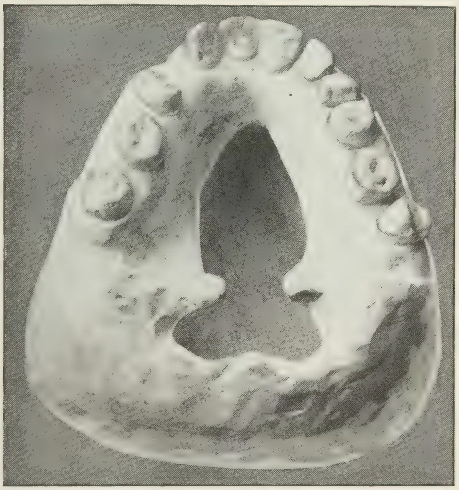
ing a resonance space, and when separated by the septum, with the hard palate beneath, forming six distinct resonance spaces.

It also shows the large naso-pharynx, another resonance cavity, regulated as to size and shape principally by the soft palate and uvula. Here can be seen also the oral cavity, still another resonator, with the tongue, soft palate, lips, and teeth, all concerned in the production of voice and speech.

Fig. 2 shows a cross-sectional view of the septum and turbinate bones, showing the resonating spaces thus produced.

Fig. 3 shows the septum.

FIG. 6.



The cartilage of the septum is a smooth, triangular plate inserted posteriorly into a groove in the perpendicular plate of the ethmoid bone; anteriorly, where it is thicker, it is connected with the nasal bones and adjacent lateral cartilage, and below with the vomer and palatal processes of the superior maxillary bones. The septal cartilage separates the anterior portion of the nasal cavities. The inner wall is the smooth septum formed principally by the perpendicular plate of the ethmoid bone, the vomer bone, and the septal cartilage. (McClellan's "Regional Anatomy.")

Many operative methods by different surgeons have been proposed and attempted with various degrees of success, so far as the improvement of speech is concerned, but all agree that the best results are obtained when the operation is done in early infancy. As a matter of fact, however, these children, owing to their inability to properly receive nourishment, are usually in no condition to undergo the operation.

Fig. 7.

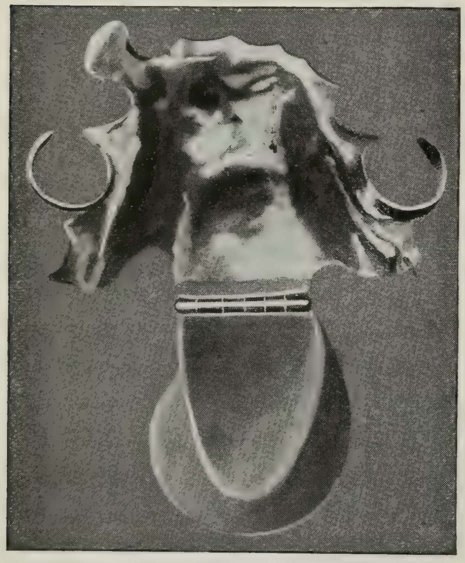
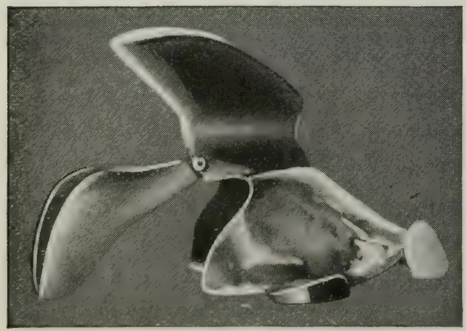


Fig. 8.

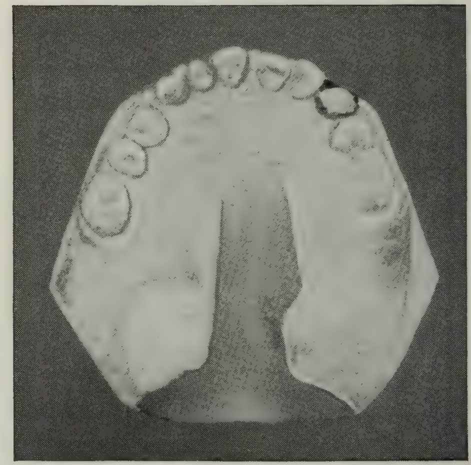


AIDING THE CLEFT-PALATE CHILD IN RECEIVING NOURISHMENT.

It is my belief that the first and most important assistance to be rendered the cleft-palate child should be aid in receiving nourishment, for upon that its whole future depends. In order to overcome this difficulty, some fifteen years ago I conceived the idea of constructing a temporary rubber appliance, covering the roof of the mouth, to which I fastened a rubber nipple. When this was placed in the mouth the cleft was closed, allowing normal suction, improving greatly the feeding of the child. (See Figs. 4 and 5.)

Dr. W. J. Roe of Philadelphia, claimed that—"The closure of the cleft, even if surgically successful, unless it restores the functions of the tissue invariably leaves the patient worse off than before, and also frequently prevents satisfactory subsequent treatment." These conditions led me to make a special study of mechanical means by which these patients could be helped, especially those of the adolescent or adult age.

Fig. 9.



To Dr. Norman W. Kingsley belongs great credit for his pioneer efforts and progress along this line.

IMPORTANCE OF RESTORATION OF NASAL PASSAGES IN CLEFT-PALATE CASES.

Appliances of many shapes and of different materials have been devised for the closure of the cleft, but with apparently little regard to the restoration of the nasal passages so as to permit normal respiration, or to the restoration of the resonance chambers for the improvement of voice and speech.

In the appliances herein described all these things have been taken into consideration, and an attempt has been made to restore *all missing tissues* and their functions.*

Case 1. A lady, age thirty-one. (See Fig. 6.) No hare-lip; cleft extending through the uvula and the soft and hard palates to the alveolar process. Vomer bone entirely missing. Width of cleft at posterior border of hard palate, thirteen-sixteenths of an inch. Figs. 7 and 8 show the appliance. The supporting plate is made of gold, with the hard-palate and vomer-bone restoration made of hard rubber. The soft-palate restoration is of hard rubber also, attached to the plate by means of a hinge, and moves with the muscular activity of the soft-palate tissue.

Fig. 10.

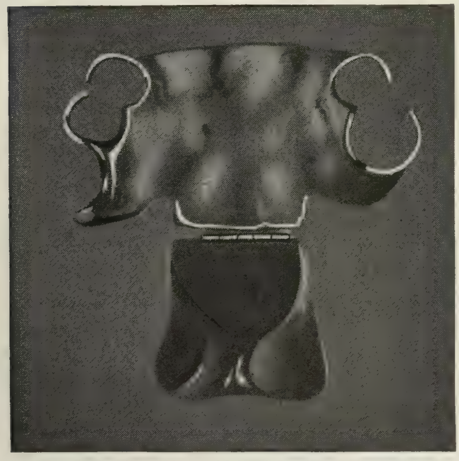
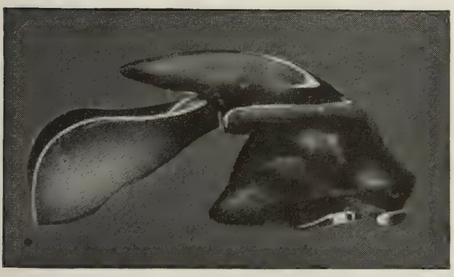


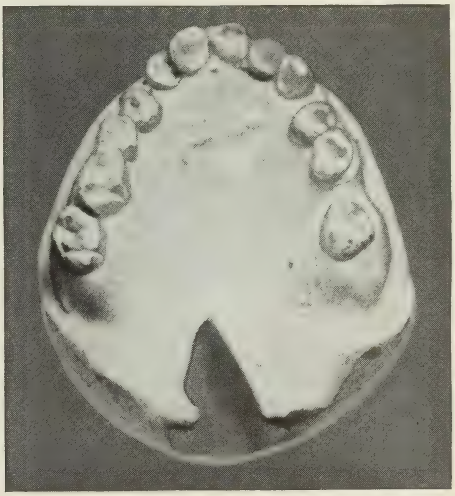
Fig. 11.



This young lady recites in public and sings before large audiences.

Case 2. A girl of thirteen. (See Fig. 9.) No hare-lip. Figs. 10 and 11 show the appliance for this case constructed entirely of hard rubber.

Fig. 12.



Case 3. A lady, thirty years of age. (See Fig. 12.) No hare-lip; cleft of soft palate only. Figs. 13 and 14 show the appliance for this case.

Just here let me call your attention to the fact that by this appliance, while the lost parts are restored to a nearly normal condition, yet speech is not restored immediately. Patient and persistent cooperation of the patient is necessary in order to bring about satisfactory results with regard to speech.

CORRECTION OF ACQUIRED DEFECTS.

In acquired defects of the palate the same principle of restoration is used, with this advantage—as soon as the tissues are restored, speech is restored.

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* At this point in the lecture, Dr. Mitchell presented a great number of pictures of models, showing a great variety of clefts, as to size and extent, pointing out the fact that they were all uniform in character, and also that the sizes of the arches was either normal or less than normal in width.

Case 4. This is an exceptional case, that of a boy of twelve (see Fig. 15) with uvula and a portion of the soft palate accidentally sacrificed in an operation to remove adenoids and tonsils at eight years of age. Figs. 16 and 17 show the appliance constructed for this case. As speech had not been fully developed at this age and nothing had been done to assist the child in this direction for four years, the restoration of speech was almost as difficult as for a congenital cleft-palate case.

Fig. 13.

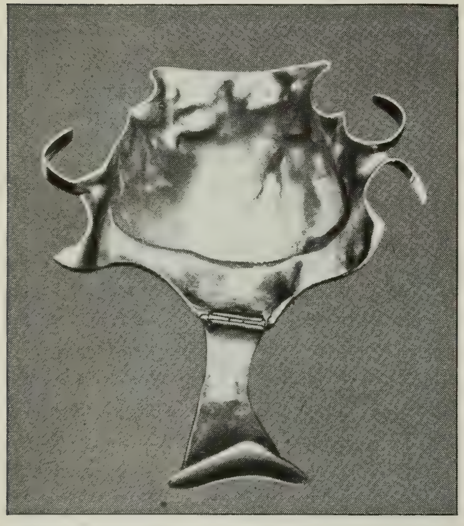
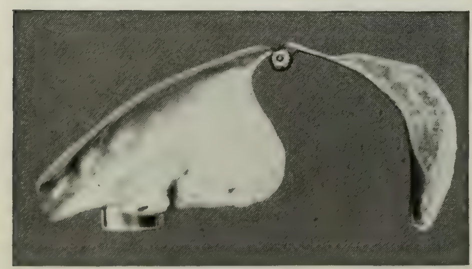


Fig. 14.

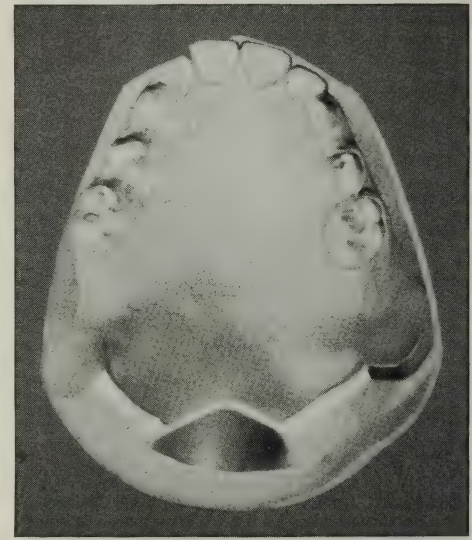


It is essential also that the nasal passages and roof of the mouth be restored so as not to interfere with speech or respiration.

PROSTHETIC RESTORATIONS IN CASES OF OSTEOMYELITIS OF THE MANDIBLE.

Deformities often follow osteomyelitis of the mandible, and much can be done mechanically to avoid or remedy these conditions.

Fig. 15.



Case 5. Fig. 18 shows casts of a mouth in which had occurred osteomyelitis of the mandible on the left side.

X-ray pictures showed extensive necrosis, which when removed would leave the mandible thin and weak, with the possibility of a spontaneous fracture. To prevent this an appliance was devised to avoid lateral strain and still allow freedom of the jaws, permitting only the direct opening and closing of the jaws. I call it the "foot and shoe" appliance, for it is a square bar, attached to the lower teeth, on the opposite side of the mouth from the necrosed condition, which slides in a three-sided groove attached to the upper teeth. This prevents any forward or lateral movement of the teeth.

Fig. 19 shows the appliance on models, and Fig. 20 gives an enlarged view.

This appliance was inserted the day before the operation, and was worn for six weeks, when it was removed.

FIG. 16.

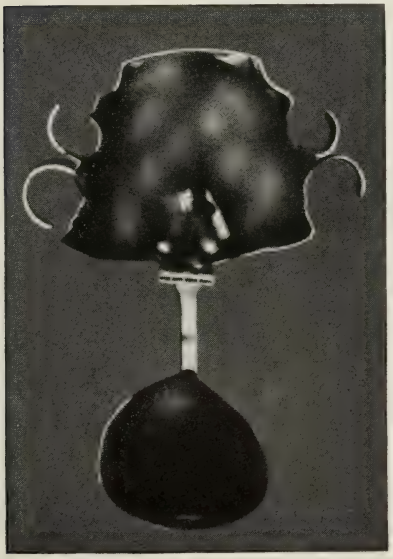
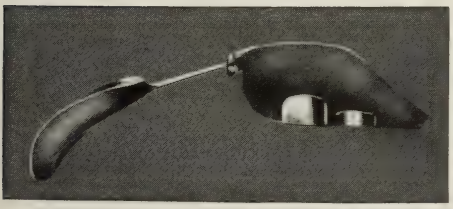


FIG. 17.

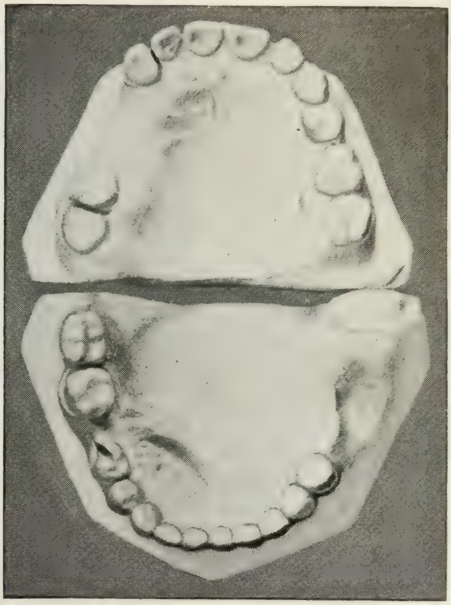


In closing I wish to report another case of osteomyelitis of the left side of the mandible, in which no preventive measures were used, and in which an extensive deformity followed.

The right side had been drawn to the left until the teeth did not occlude, and the ramus drawn forward until the patient could not open the mouth more than one-quarter of an inch.

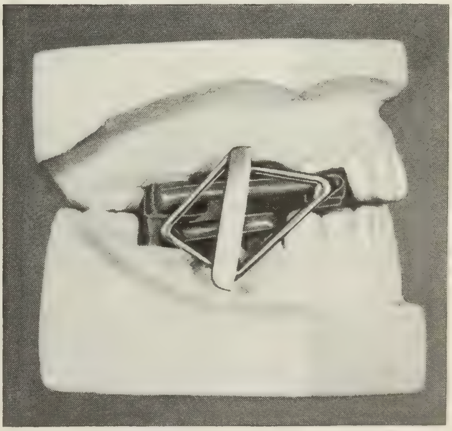
Bone grafting was decided upon. An interdental rubber splint was made.

FIG. 18.



In presence of Dr. C. A. McWilliams and Dr. H. S. Dunning, the mandible

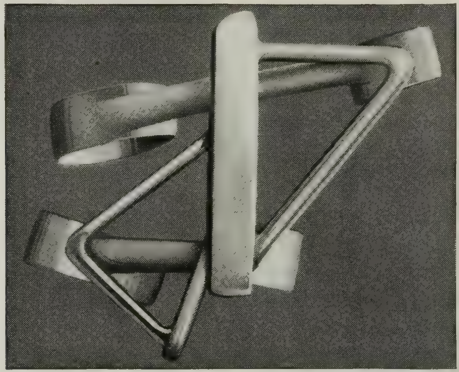
FIG. 19.



was separated in the canine region, operating from the outside; the ends of the bone were made straight, the splint inserted forcing the teeth to proper occlusion. A measurement of the space between the ends of the bone was taken, and a segment of the tibia was removed and grafted into it.

Union took place and the splint was removed after three months; the patient now has very fair use of the jaw.

FIG. 20.



[A number of other pictures were shown, illustrating these conditions, the appliances, and results.]

Trouble *with* Pulpless Teeth and Trouble *from* Pulpless Teeth.

By ELMER S. BEST, D.D.S., Minneapolis, Minn.

(Read at the annual meeting of the Pennsylvania State Dental Society, Pittsburgh, June 27, 1916.)

IN presenting this subject to you tonight I shall resort to the use of a simile, for by so doing I believe that I can more clearly bring home to you a point that I consider of great importance.

The farther mankind advances in this world the more do the problems of life and death become inseparably involved with and dependent on the action of his fellows upon the individual man. In the early days of our history, when we roamed comparatively free, nature was the only element which influenced our action.

How different it is today. Everything we do, everywhere we go, everything we eat, even our existence in this world, is made possible by the efforts of our fellows.

In case of the failure of any man to do his duty, censure, if not actual punishment, is administered in proportion to his intelligence and responsibility. As we advance up the scale of life the responsibility of the individual increases, from the man who has no responsibility until we reach the point where men are intrusted with the custody of human life, the most valuable asset in the world. Of this class we have two examples—

the one who holds in his hands, so to speak, the lives of many, owing to a position as superintendent of public conveyances, and the trained specialist, such as the surgeon, into whose hands the patient places the safeguarding of his life.

RESPONSIBILITY OF THE DENTAL PROFESSION.

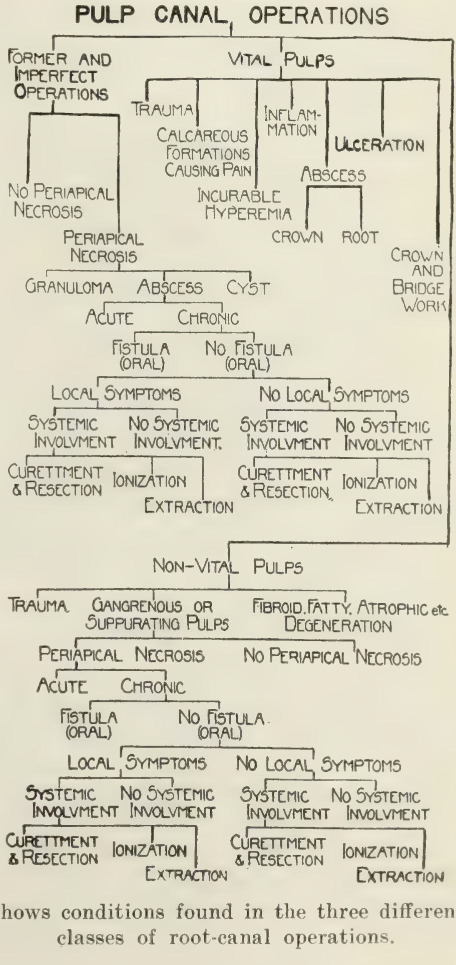
Where in the scale do we as dentists come? If, when judged in the spirit of fairness, our responsibility is considered a light one in case some act of ours should result in a serious harm to a patient, then indeed we have not progressed very far; he who is not expected to know better, escapes with little or no punishment.

I am glad to say that this does not apply to many of the profession, but it may be a true commentary on a small percentage. This point was brought clearly to the essayist's attention recently at the Nebraska State Dental Society meeting, when as fine a body of men as I ever saw sat in rapt attention during a splendid lecture on this subject by Dr. Weston A. Price. Upon the completion of the lecture one of their most prominent men arose and said, "Gentlemen, if there is a man in this room who does not feel like a criminal, I want him to stand up." Nobody made a move.

An ordinary mechanic may understand some of the trouble he may have in adjusting, for instance, the apparatus controlling the air-brake in a locomotive, but only the man who has charge of the lives of the passengers on the train can realize fully the awful possibilities of trouble from those brakes. Similarly, the mechanic who constructs surgical instruments may understand the trouble he may have in constructing a certain instrument, such as an artery forceps, but it is only the surgeon during an operation who can fully realize the possibly fatal results of trouble from the instrument if defective.

Again let me ask, In which one of these classes do you and do I as dentists wish to be placed? How many want to be limited to the sphere of the mechanic? Are we to be satisfied with our belief that we do not have any trouble with pulpless teeth, that there is nothing to be considered, outside of a few visible symptoms at the time of operating? or are we broad enough, big enough, honest enough, to think that perchance our patients are having considerable trouble from their pulpless teeth, even though we may be responsible for them? Yes, I believe we are big enough.

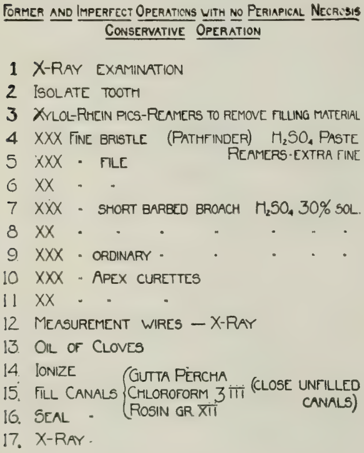
CHART I.



Shows conditions found in the three different classes of root-canal operations.

Commenting further on this subject, your essayist wishes to draw your attention to a certain condition which is coming into a very real existence. If the dental profession as a whole does not cease handling pulpless teeth in the incompetent manner in which we know from an examination of thousands of cases they have been handled, then the medical profession will exercise their prerogative and say when we shall and shall not handle pulpless teeth.

CHART II.



FORMER AND IMPERFECT OPERATIONS WITH NO PERIAPICAL NECROSIS
CONSERVATIVE OPERATION

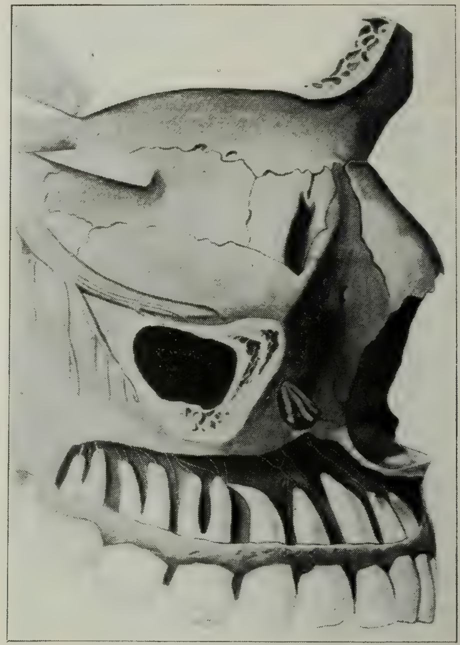
1 X-RAY EXAMINATION
2 ISOLATE TOOTH
3 XYLOL-RHEIN PICS-REAMERS TO REMOVE FILLING MATERIAL
4 XXX FINE BRISTLE (PATHFINDER) H_2SO_4 PASTE
5 XXX - FILE REAMERS-EXTRA FINE
6 XX - -
7 XXX - SHORT BARBED BROACH H_2SO_4 30% SOL.
8 XX - - - - - - -
9 XXX - ORDINARY - - - - -
10 XXX - APEX CURETTES
11 XX - - -
12 MEASUREMENT WIRES — X-RAY
13 OIL OF CLOVES
14 IONIZE
15 FILL CANALS {GUTTA PERCHA, CHLOROFORM ʒ iii, ROSIN GR xii} (CLOSE UNFILLED CANALS)
16 SEAL -
17 X-RAY -

Shows the various steps involved in a conservative operation. That is, when our duty is completed—when we have cleaned and filled the canals.

SERIOUS EFFECTS OF INFECTED ROOT AREAS.

A sufficient number of such cases have come under my observation to prove to me beyond peradventure that this condition is not merely a logical supposition, but an actual condition of affairs that exists today. The wide-awake physician knows from experience the baneful effect upon the health of a patient of even one area around a root-tip where we have an infective process going on. What must these men think of our ability when they send a patient to us and ask for a report on the condition of the mouth, that field over which we are supposed to have supervision, when we say to them that we see no pyorrhea and that there are no cavities, hence the mouth is in perfect condition? We censure them for taking these cases out of our hands, having the jaws radiographed, and then demanding the extraction of certain of the teeth, making, as they certainly do, many mistakes in their interpretation of the radiographic films and in their recommendations.

CHART II B.



Shows the indications for a radical operation. A diseased area is seen over the canine, the removal of which would be a necessary sequel to a root-canal operation. Also under classes I and III, less frequently in class II, it would be advisable to remove the apical portion of the second bicuspid, which we might be unable to open and clean and fill.

It must not be assumed from the foregoing that your essayist would for a moment enlarge upon any unpleasantness that might arise between the members of the two professions over this class of cases, for our experience has been that when the internist realizes that the dentists understand that there are certain disease conditions aside from cavities and pyorrhea and fistulous abscesses, and that they have the courage to look for them, their co-operation will be found always pleasing and very beneficial. I have never seen an exception to this rule.

WHOLESALE EXTRACTION OF TEETH UNNECESSARY.

Most unfortunate though we must admit it to be, yet it is an undisputable fact, as I have just admitted, that through a mistaken interpretation sometimes sound, healthy teeth have been removed in the assumption that they were diseased, and also some pulpless teeth have been removed that could no doubt have been saved for the patient; and further, while it is true that some badly infected teeth have been removed without doing the patient's impaired health any noticeable good, yet in spite of this array of evidence which we sometimes muster for our defense, your essayist is firmly of the belief that the injury we do our patients by leaving in their jaws large infected areas due to pulpless teeth is greater than the harm that is done by the other method of treatment. In spite of the foregoing, however, I am not in favor of wholesale extraction, but believe that these areas can be removed in a great many cases, and yet the teeth be saved for the patient.

CHART III.

Non-Vital Pulp **Non-Infective**

1 X-Ray examination
2 Isolate tooth
3. Remove tissue in pulp chamber
4 · · · large canals with sterile barbed broaches
5. In Fine Canals Pathfinder H_2SO_4 30% sol
6. XXX Fine file
7. XX · ·
8. XXX Short barbed broach H_2SO_4 30% sol
9. XX · · · · · ·
10. XXX Fine barbed broach · · ·
11. XXX · Apex curette
12. XX · · ·
13. Measurement wires —X-Ray
14. Oil of Cloves
15. Fill canals
16. Seal
17. X-Ray

{Gutta Percha
Chloroform ʒiii
Rosin gr. xii} (close unfilled canals)

In this operation we are not dealing with an infectious pulp; hence do not have the danger of carrying any of this material through the foramina.

CHART IV.

Non Vital Pulp
Gangrenous or Suppurating Pulp

1. X-Ray examination
2 Isolate tooth
3. Remove contents of pulp chamber
4. a) Seal-Formo-Cresol
b) Sodium Potassium
c) Sulphuric Paste } immediate operation
5. Oil of cloves dressing
6. Pathfinder H_2SO_4 30% sol.
7. XXX Fine file
8. XX · ·
9. XXX Short barbed broach H_2SO_4 30% sol.
10. XX · · · · · ·
11. XXX Fine · · · · ·
12. XXX · Apex curettes
13. XX · · ·
14. Ionize
15. Measurement wires —X-Ray
16. Fill canals
17. Seal ·
18 X-Ray

{Gutta Percha
Chloroform ʒiii
Rosin gr. xii} (close unfilled canals)

We must be very careful not to carry any of the infectious contents of the pulp chamber and root-canals through the foramina.

The great amount of disease following in the trail of the improper handling of pulpless teeth has led some of our most conscientious men to the belief that if we were to leave the pulps in teeth that are being crowned and used as bridge abutments we would have solved the question of these infections. To our sorrow we have learned that this is not a panacea for our troubles, and further, that when we have an infection following the death of a pulp *en masse* the resulting periapical involvement is likely to be much more extensive than it otherwise would be.

NECESSITY FOR GREAT CARE IN DIAGNOSIS OF SYSTEMIC CONDITIONS RELATED TO THE TEETH.

However, at this point I would like to draw your attention to the fact that we are very prone to fall into error in coming to conclusions regarding the causes of pulp death under large metal restorations. In such a case, how are we to know it was the artificial restoration that caused the death of the pulp? and if we are quite positive that it was, how do we account for an analogous condition in the case of an apparently sound tooth which has not in any manner been injured? I raise this point to show that we must be very careful in saying positively that certain conditions are due to certain causes. Also, for the benefit of some of those who, when they happen to see a tooth with an apparently well-filled root from a mechanical standpoint, but having a diseased apex, forthwith proceed to make the statement that properly filled roots do not prevent diseased periapical conditions: Have they been very careful to obtain a definite history of that particular case, and determine that the disease condition did not exist previous to the insertion of the root-filling, or that precautions were or were not taken to preserve asepsis during the operation?

CHART V.

Vital Pulps

1 X-Ray examination
2 Local anesthesia
3 Isolate tooth
4 Remove coronal portion
5 Large canals – barbed broach
6 Fine canals – Pathfinder H_2SO_4 30% sol
7 XXX Fine files ·
8 XX · ·
9 XXX Short barbed broach H_2SO_4 30% sol
10 XX · · · · ··
11 XXX Fine barbed broach
12 XXX · Apex curettes
13 XX · · ·
14 Measurement wires X-Ray
15 Fill canals {Gutta Percha …
Chloroform ʒiii (close unfilled canals)
16 Seal · {Rosin gr xii
17 X-Ray

In removing a pulp, if a diseased condition appears around the apex of the root we must hold ourselves responsible. In this class of cases arsenic and powerful tissue-destroying drugs in root-canals are contra-indicated.

CHART VI.

Probable Causes of Periapical Abscesses

1 Use of Arsenic
2 Not using Rubber Dam
3 Sealing Dressings with Cotton or Porous Cements
4 Not Removing All Decay from the Cavity
5 Not Cleansing the Field of Operation
6 Use of Unclean Chip Blowers in Pulp Canals
7 Use of Non-Sterile Cotton from Exposed Cotton Holders
8 Wrapping Cotton on Smooth Broaches with Unclean Hands Immediately before Placing in the Canal
9 Not Using Clean Instruments Sterilized Immediately before Using
10 Sealing in as Dressings, Irritating and Tissue-Destroying Drugs
11 Leaving in the Canals Non-Vital Pulp Tissue
12 Forcing Instruments and Drugs thru the Apex
13 Not Removing all the Moisture from the Canals
14 Not Filling Canals to Apex
15 Use of Medicated Canal Pastes which Destroy Periapical Tissue
16 Not Sealing Canals upon Completion of Filling
17 Paying little or no Attention to Asepsis

In case we have been guilty of any of these conditions we have contributed our share to the great number of infected pulpless teeth. Arsenic is dangerous and unnecessary. Periapical tissues are frequently destroyed by powerful drugs sealed in canals, and these areas may become the seat of an infection of secondary origin—of hematogenous origin.

There is, of course, a just criticism at this point if such an assumption be made in the light of our present knowledge. This was probably excusable in past years, but ordinary ability would not allow such conditions to pass unnoticed at the present time—ordinary ability in this case meaning in a legal sense.

PULPLESS TEETH NOT "DEAD" TEETH.

A matter that has given your essayist much worry and one on which he still seeks light is the momentous question of "when to extract and when to save pulpless teeth." Remember these are not "dead" teeth; if they were they would all be extracted. Possibly we have been responsible for the term dead teeth being used so frequently that the medical fraternity have come to consider pulpless teeth as dead teeth, and as such they are considered foreign bodies which nature will try to throw off. Such an assumption is of course due to an ignorance of dental anatomy.

While it is quite obvious that a pulpless tooth can never be considered quite as good as one with a live healthy pulp, yet it is my belief that a tooth can be pulpless and be a perfectly sound, healthy unit in the masticatory apparatus. As a result, such teeth should not be extracted simply because they are such, but if the odds are not too great against us we can in the majority of cases place these teeth in such a condition that their retention will not be a menace to their host. But in a severe case of neuritis, neuralgia, arthritis, gastric ulcer, or any of the other systemic manifestations of a focal infection, to my mind our duty is obvious. When we have made a complete radiographic examination of the jaws and a faradic test of the teeth, and find that more or less extensive areas of diseased tissue exist around the apices of teeth which we have proved to be pulpless, these areas must be gotten rid of, and to my mind the removal of the teeth depends upon the gravity of the case.

CHART VII.

How to Avoid Periapical Abscesses

1. Use of Anesthetics (Local)
2. Use of Rubber Dam
3. Sealing Dressings with Combination of Cement and Gutta Percha
4. Thorough Removal of All Decay from the Cavity
5. Liberal Application of Iodine and Alcohol to Field of Operation
6. Use of Filtered Compressed Air
7. Use of Sterile Cotton
8. Use of Sterile Dressing Bristles and Canal Points
9. Sterilization of All Instruments Immediately before Using
10. Use of Non-Irritating Drugs as Dressings
11. Thorough Removal of All Organic Tissue
12. Careful Roentgen Examination of the Tooth Including Measurement Wires
13. Proper Guidance and Care in Handling Instruments and Drugs in Canals
14. Having Canals Dry to Apex before Filling
15. Sealing Foramina and Filling Canals with Inert Insoluble Non-Irritating Substance
16. Sealing Canals Flush with Floor of Pulp Chamber with Oxy-Chloride of Zinc Cement
17. Maintenance of Asepsis During the Operation

Contains some practical hints which will assist us in obtaining more satisfactory results from our operations. In dental surgery in systemic aspects the same principles apply as in general surgery.

If the patient's condition will permit we may remove these areas after cleaning the root-canals and filling the roots and leaving the tooth *in situ,* only removing as much of the root apex as may be affected. However, where the condition of the case is very serious, and where the internist has been unable to locate any other origin of trouble and it may be a choice between the loss of one or more diseased teeth and the patient's life, we must select the most serious ones first, and proceed with extraction, being careful to not remove more than one or two at a time. In view of the fact that many a patient's health has been restored by such procedure we are justified in counting on this result, and advising the removal of these teeth.

I say this regardless of the fact that on some occasions this measure has failed to give the much-coveted result. We all know of some such cases, and until we have mastered the situation thoroughly they will continue to occur, and we who have never had the courage to remove a tooth unless we could see the diseased portion with the naked eye, will relate these instances with much gusto, sometimes telling of some frightful incident that has happened as the result of some mistake on the part of a radiographer, thereby trying to discourage the use of the X-ray in dentistry. The less serious the case the fewer pulpless teeth should be extracted, down to the class where we have several pulpless teeth in a mouth that can all be saved if we put them in a healthy condition—performing root-canal operations in a manner that will reflect credit on the operator, and where diseased periapical conditions exist, performing the necessary curetment and root resection.

CONDITIONS RESULTING FROM PULPLESS TEETH.

In order that we may thoroughly understand the significance of the difference between trouble *with* pulpless and trouble *from* pulpless teeth, I will enumerate the conditions found under each class. Under those of "trouble *with* pulpless teeth" we have—

(1) The numerous and various difficulties encountered in opening canals and removing pulp tissue where we carry the operation through to a completion, not stopping at the first obstruction we meet, and calling it the end of the root.

(2) The tooth becoming sore after the operation.

(3) In case the irritation is septic, the swelling, heat, and pain that follow.

(4) The appearance of a sinus.

(5) The patient complaining that the tooth occasionally feels sore.

Conditions found under the heading "trouble *from* pulpless teeth" are—

(1) No soreness noticeable around the tooth —generally.
(2) Generally no sinus.
(3) Persistent headache.
(4) Arthritis.
(5) Neuritis.
(6) Kidney or liver infection.
(7) Heart infection.
(8) Gastric ulcer.

—and many other forms of pathologic conditions found in various portions of the body, and which are due to the absorption of the poisonous products from these areas which we dentists have planted without our own knowledge or without the patient's consent.

THREE CLASSES OF ROOT-CANAL OPERATIONS.

In considering root-canal operations we think it advisable to divide them into three main classes:

(1) Those on teeth which contain former and imperfect operations.

(2) Those on teeth containing vital pulps.

(3) Those on teeth containing non-vital pulps.

In doing operations on teeth in classes 1 and 3 and occasionally on multi-rooted teeth in class 2, we find it the best practice to consider the indications for conservative and for radical operations.

By conservative operations we mean those in which we assume that our duty is performed when we have under aseptic conditions removed the organic tissue, cleansed the canals, sealed the foramina, and filled the canals.

By radical operations we mean all the above, and in addition the removal of diseased periapical tissue and sometimes root resection because of the death of the peridental membrane around the root apex; also on some occasions because of our inability to remove the organic tissue from the apical portion of canals and to fill the canals.

404 DONALDSON BLDG.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Connecticut State Dental Association.

Fifty-second Annual Convention, held at New London, Conn., June 13 to 15, 1916.

TUESDAY—*Morning Session.*

THE fifty-second annual meeting of the Connecticut State Dental Association was called to order at 11 o'clock, Tuesday morning, June 13, 1916, by the president, Dr. A. V. Prentis, New London, in the ball-room of the Griswold Hotel, New London, Conn.

Dr. G. S. B. LEONARD, Mystic, on behalf of the members of the society, presented to the president, Dr. Prentis, a handsomely engraved gavel as a memento of the fifty-second annual meeting of the Connecticut Association.

The first order of business was the reading of the minutes of the previous meeting.

Dr. BECKWITH-EWELL moved that the reading of the minutes be dispensed with, as they had appeared in the published Transactions. (Motion carried.)

Reports from the Executive Committee, the Committee on Necrology, the Committee on By-laws, the Membership Committee, the Board of Censors, the Treasurer, were received and acted upon.

Dr. SEARS moved that telegrams of greetings be sent to Dr. W. S. Smith, Mystic, Dr. W. O. Beecher, Waterbury, and Dr. A. J. Flanagan, Springfield, Mass.

Motion was then made and carried to adjourn until the afternoon session.

TUESDAY—*Afternoon Session.*

The meeting was called to order Tuesday afternoon by the president, Dr. Prentis.

Dr. PRENTIS introduced to the society the Hon. Ernest E. Rogers, Mayor of New London, who welcomed the association to New London.

The President announced as the next item on the program the reading of a paper by Dr. N. S. HOFF, Ann Arbor, Mich., entitled "Plate Prosthesis," as follows:

[This paper is printed in full at page 158 of the present issue of the COSMOS.]

DISCUSSION.

Dr. N. S. Jenkins, New London, Conn. There is no more important question that could possibly come before this society than the one which Dr. Hoff has just presented—virtually, What is the dentist there for? Dr. Hoff has told us that the physician is there to endeavor to make compensation for defects in nature or those arising from misfortune. What have we to do with restoring the human being who comes to us because he has met with an accident or has been afflicted with disease? We have *much* to do; we are responsible, as far as our attainments enable us, for placing him in a condition of health and comeliness.

We have found it comparatively easy

to make a pretense of restoration where the teeth have been lost. Vulcanizable rubber, while a very great boon to humanity, has made it comparatively simple to make a restoration which does fairly well. But how often is that restoration made so that the functions of mastication and speech are satisfactorily regained in conformity with the preservation of nature's symmetry of line and shape and color?

I believe, from the long experience and observation which I have had in practice, that there should be found in every small community an able and conscientious dentist who gives his entire time and thought to plate prosthesis; and that men who have not his skill or do not possess the same interest in that class of work, should refer their patients to him. It is a specialty of great importance, and one of great beneficence. I suppose all of you have had occasion to take some unfortunate patient who has been ill-provided with an artificial substitute, and I doubt if you have ever had a more grateful patient than such a one whom you have restored to oral health and comeliness.

When the patient puts himself in the hands of the physician or dentist, the physician or dentist assumes a sacred obligation. He has no right to give to that case, however humble the patient may be or however unimportant the operation may seem to be, anything but his very best effort; for to the patient and to the doctor that treatment should be for the moment the most important thing in all the world.

Dr. Hoff deserves our gratitude for bringing this subject before us and enumerating the methods by which one can obtain accurate results. I was pleased to hear him speak of the method by which he obtained the bite. He does not rely upon a mathematical formula, but concerns himself with the individuality of the patient. No two patients are alike, and in any case of plate prosthesis it is essential that we should regard the individuality of the patient, and restore him, through the resources of our art, to a normal condition.

Dr. E. S. Gaylord, New Haven. We are all very glad to hear again from Dr. Hoff. He has presented to us a subject which embraces so many different points that it is difficult for me, at least, to speak intelligently on the entire subject, so I shall attempt to speak only of one branch, and that is the restoration of conditions by means of bridges.

We are hearing very much at present in relation to hygiene of the mouth, and I apprehend that the day is not far distant when we shall get another thrust from the medical profession in relation to unhygienic mouth conditions which we tolerate—and not only tolerate but produce; and yet by prophylaxis and instruction of patients we are trying professedly to eliminate these conditions of uncleanliness. I make bold to assert that the man who inserts fixed bridge work—any kind of fixed bridge—in the mouth is performing an operation which is not only a detriment to the patient but a discredit to his profession; the man who defaces his patient by exhibiting fillings and crowns is doing an injury to the patient because he makes that patient a hideous object to his fellow men. We should be above this general exhibition of our work, and above all we should be above placing a fixed denture in the mouth and attempting to make the patient believe that the mouth can be kept in a cleanly condition. You may say that you make self-cleansing bridges, but I do not believe that such is the case. In the past no one could have been more enthusiastic in regard to this kind of work than myself, but I have lived to see the time when it is a source of greatest regret to me that I ever placed a fixed bridge in any mouth. It is a vile structure and cannot be otherwise; the patient cannot keep it clean, and it harbors millions of micro-organisms that are detrimental to the patient.

The matter of making dentures has become, as Dr. Hoff tells us, largely a commercial affair, and it is very difficult to eliminate that. It is very simple for the dentist to make impressions in his office and send them to the laboratory for completion—much more so than to construct the denture himself, and it is going to be pretty difficult to eliminate that. However, it should be done, and Dr. Hoff has given us some very valuable points along that line.

Dr. C. W. Strang, Bridgeport. I feel very much in this matter as Dr. Gaylord has expressed himself, and yet when the claim is made that all fixed bridges are filthy, I shall have to take exception to that statement, for I do know of some fixed bridges that have been in service for twenty years and look as though they might remain for twenty years longer, so far as the health of the teeth to which the bridges are fixed and also so far as cleanliness is concerned. There is, however, a great difference in people. Some patients never learn the art of thoroughly cleansing their teeth with the toothbrush, and whatever of time has been spent with them in giving instructions and directions in regard to the manner in which the teeth should be brushed or the toothbrush handled in order to secure a cleanly condition of the mouth is just like pouring water on a sandbank—there is nothing retained. On the other hand, I have other patients who are just the opposite; they are faithful, follow directions, and always come with clean mouths even though they may have been away from the office for a number of months. It is of course exceedingly discouraging when one has done his best in bridge work or plate work to have the patient return with the mouth in an unclean condition. However, we have such cases. I apprehend that every dental practitioner in the hall meets them.

I had the very great privilege of being associated with Dr. Bonwill in college for one session, and the way he would put the porcelain teeth on the corundum wheel would sometimes make the students sick, thinking that everything would be damaged, and yet Dr. Bonwill, when he ground teeth, ground them with a purpose, so that when they were attached to a plate and put in the mouth they would give a natural appearance and a natural expression to the patient. I have worked along that line in my whole dental practice. I am on my fiftieth year in dental practice, and have never allowed myself to quite give up plate work, because I have felt an interest in it, and if I could make but one plate in a month or in six months, it would be a matter of satisfaction to me. While I have not very much time to put into it, still my interest is there, and occasionally I spend an hour or two or a day or two in the laboratory, because it is a relief from the operating chair and the nervous energy that is consumed in manipulations about the mouth.

I have never resorted to any of the new articulators that have come on the market in the last few years. I think perhaps I may have erred in not adopting them, but I do spend sufficient time, as remarked by the essayist, in getting what I consider the proper occlusion of the teeth.

Dr. J. W. Harper, Hartford. I did not intend to speak during the meeting, but I am getting so tired of hearing bridge work damned that I am going to speak. To begin with, there is such a thing as bridge work *and* bridge work. You can have a short-bite bridge and a long-bite bridge; and I claim that it is possible for you to instruct the patient so that he can, with the aid of a pair of light pliers, and pellets of cotton covered with toothpaste, keep a fixed bridge clean. I have seen them kept clean in that way. If the dummy teeth are made to represent natural teeth and the separation at the top is such that the patient can get between them, or if the bridge is lined with platinum at the surface which fits against the gum, so that it will not irritate the tissue. I believe it is possible to keep that bridge clean—provided the teeth are made after the manner of the natural ones.

Here is an example of another kind of bridge work that I am making today: Suppose the patient to be a young lady who refuses to wear a plate, and who has lost the left central incisor, how are we to make the restoration? I had a case of this kind recently in which it was necessary to supply a split central that I tried to fix, but found it impossible to repair, and I am bridging the case. The lateral incisor I found was devitalized and had a large filling on the palatine surface. I countersunk the filling at the point where the lower incisor touched the palatine surface, then drilled a hole in the filling for a pin—about 18-gage in this case. Then I made an impression and stamped a backing of 22-k. gold (silver alloy) 34-gage; punched a hole in the backing, put in the pin with sticky-wax, removed and soldered. In the right central two smaller pins were placed at the side of the pulp, and backed up in the same way. The dummy was waxed into position, the whole removed, invested, soldered, set in position, and the edges burnished. I do not see any reason why a bridge of this sort cannot be kept clean where you have flat and smooth surfaces and perfect edges, as nothing can lodge against that flat surface. The tongue alone will keep it clean. I claim that it is absolutely unnecessary in the case such as I have described to send that young lady through life with a plate—your plate with clasps has its objections, aside from the annoyance. So I protest this damning of bridge work indiscriminately. There are particular cases that can be kept clean, and where the patient will not have a plate, and I claim that bridges are best in those cases. I do not believe in large bridges, only in short ones, and those only where conditions are favorable. But I *do* believe in the dentist making his own caps for anchorages, where gold caps are used, and not buying them ready-made.

Dr. C. F. Bliven, Worcester, Mass. I think I have seen some artificial plates in mouths that were as filthy as any bridge work I ever met with, and the patients certainly had a much better opportunity to keep them clean than in the case of bridges. It is my opinion that the matter of cleanliness does not depend so much upon the care that the teeth get as the care that the alimentary canal gets. If the waste products of the system are not eliminated properly they are bound to manifest themselves somewhere in the system, and when they do so in the mouth, whether you have a plate or a bridge—I do not think it makes much difference so far as the cleanliness is concerned—in that case the teeth will be filthy. There is a better opportunity to remove a removable bridge and clean it than there is to remove a fixed bridge, but the fixed piece can be cleaned provided it is properly made. I have never put in but one large bridge, and that was within the last year, when I put in a ten-tooth bridge and that is clean at the expiration of a year's time, and is as well kept as any other teeth in the mouth; but I would not recommend that practice in all cases.

Twenty-five years ago porcelain bridges were brought out and used extensively. There are not so many used today, but my experience then was that porcelain would keep as clean in the mouth as would the natural teeth, if not cleaner. I have many cases where I have been obliged to remove calcareous deposits from natural teeth but not from porcelain teeth. The expense of the porcelain bridge, however, when we had to compete with the laboratory man, prohibited its use, because patients did not seem to be inclined to pay the fee necessary for a first-class piece of workmanship in porcelain. I have found also that platinized gold and iridio-platinum will resist these deposits better than gold.

Dr. Jenkins has given us the very ideal condition of having one man in the smaller communities to whom patients could be referred for artificial dentures, and while this is a very good idea with regard to the construction of plates, I would like to have him give us an ideal method for collecting proper fees for such work.

Dr. A. A. Hunt, Hartford, Conn. There is one aspect of the subject that appeals to me rather forcibly. I have realized in later years that when I began to practice I was very much afraid I would charge people more than they could afford to pay. I think many dentists, in fact all of us, have been very much afraid that the patient could not pay the fee.

When I started in to practice in Hartford, I began with lower prices, because

I felt that I could not get the fees in Hartford that are gotten in New York, but I have found that patients are only too glad to pay a little higher fee to get that which is as nearly perfect as it is possible for us to make.

Dr. Hoff (closing the discussion). I had no desire to provoke a discussion of bridge work in this paper. I believe in proper bridge work. What I am specially interested in just now is better plate prosthesis. We are all anxious for better dentistry of every sort; it is what we are all striving for, because our patients are demanding it, and we are conscious of the fact that the best we can do is not as good as we idealize.

The reason I presented this paper to this society is not that I think you need it more than anyone else, for I do not know your attitude toward this work, but I do know that it is being sadly neglected in my section of the country and elsewhere that my travels take me. I am hoping that this paper and the clinic may serve the purpose of getting the subject before you in a manner that will help to renew your interest in a sadly neglected branch of dental practice.

The medical and secular press of the day is making such unfavorable comment on repair dentistry of every sort that it seemed to me this was a timely topic for our consideration.

I am particularly interested in better prosthetic dentistry, but did not intend to cast any reflections on bridge work, and do not think I did. I made the statement that there were as many chances of inoculating our patients by bad plate work as by bad bridge work, and I might have included other dental ministrations. I cannot say positively, of course, that more people are suffering from ill health because of ill-fitting or improperly adapted dentures than other forms of dentistry, but I am afraid that if our medical critics investigate our plate department they will call upon us to either discard artificial dentures or make them better.

One of the gentlemen discussing the paper said he had seen plates that were as filthy as any bridge could be. This is undoubtedly true, as very often we encounter plates that have been worn many years longer than they should have been, and perhaps they were badly made and adapted in the beginning, or they may have had indifferent care.

The point that I am particularly anxious to develop is that we must give more time and attention to the proper construction and adaptation of prosthetic dentures than is now customary.

I would like to cite as an illustration of our inefficiency the case of a dentist who had the misfortune to lose his teeth through an accident, and was compelled to wear a denture. Naturally he applied to the best prosthodontist he knew, who made several dentures before he got one that he thought he would ever be able to wear at all, and get a reasonable degree of function; finally, by persistent effort and the grinding of the occlusal surfaces he was able to use them comfortably. They may have been set in apparent occlusal relations at first, but evidently not in proper articular relations. The dentist, however, supposed that it was his duty to "get used to them," as we tell our patients, and only by his persistent effort was he able to overcome the defective effort of the prosthodontist. He did this in a perfectly satisfactory manner by seating himself in front of a mirror and finding out where the articulation was faulty, and by grinding the articular paths to harmonize with his muscular functions he finally secured an acceptably balanced denture. He was a dentist, and was determined to have that which suited him rather than force himself to a long and tedious process of readjustment of his functions, which is the process to which many of our patients are subjected.

The question which such an incident raises is, How can we expect patients to ever get accustomed to the kind of dentures they get from the average dentist, and why cannot all dentists take more interest in this branch of true professional service?

Dr. Jenkins suggests that we should have a specialist in this department in every town. This would help, undoubtedly, but such a dentist would not be supported adequately, because he would exact proper fees, and then the other dentists would not support him, as they do not consider the services worthy of a professional fee; they can hire a boy to do it, or they can send it to the commercial laboratory.

Most dentists when approached on this subject say they cannot afford to do this work, as their patients will not pay the fee that justifies them for the time and effort. Because patients in a town have been educated to pay ten dollars for a plate is no reason why they may not be educated to pay a proper fee for a truly professional service. In my experience it is altogether a question of putting the value in the service that governs the amount of the fee and the willingness of patients to pay. If one needs a critical surgical operation or important legal advice, he does not consider the price or seek out the cheapest doctor or lawyer in town. If we could bring ourselves to believe that a prosthetic denture was of as much value to our patient as a bridge restoration or a pyorrhea treatment, and put the same skilful treatment into these cases, we should not find it difficult to convince patients of the justice of adequate fees. Why do we raise this question at all with patients? Physicians think it undignified and unprofessional.

As a matter of fact plate prosthesis is one of the most valuable services we render, and if adequately done, patients will not only appreciate the service but be willing to compensate the dentist for it. We do not get large fees for this kind of service, but there is absolutely no reason why we may not receive sufficient compensation to make it well worth while. There are men who get larger fees for no more difficult or needed services. We can explain the matter in no other way than that it is traditional, which means that it is on the same basis as the price of carfare or newspapers. Because we can send our plate work to the commercial laboratory and have it made and returned to us for a definite price, and we can then add our profit and deliver it to the patient, we should not get the idea that we are rendering our patients a proper service. We may be able to utilize ready-made hats and shoes, but we can never apply the same economies to dental services. It is all wrong, and we must get away from this method of thinking, if we are to get this branch of service on a proper professional basis.

The meeting then adjourned until the evening session.

Tuesday—*Evening Session.*

The Tuesday evening session was devoted to a talk by Dr. H. S. Dunning, New York, on "Local Anesthesia." In connection with his talk, Dr. Dunning showed a moving-picture film of Dr. Guido Fischer operating under novocain.

Wednesday—*Afternoon Session.*

JOINT SESSION WITH THE

Connecticut Dental Hygienists' Association.

The meeting was called to order at 2 30 o'clock Wednesday afternoon by the president, Mrs. Irene Newman.

The vice-president, Miss Harris, occupied the chair while the president, Mrs. Newman, read her annual address, as follows:

President's Address.

By Mrs. Irene Newman, Bridgeport, Conn.

Over a year has elapsed since the first annual meeting of this organization, and we find that during that time much progress has been made in increasing our membership, in spreading the interest in preventive dental clinics for school children, and in the placing of the dental hygienist on a more stable and less questionable legal basis.

MEMBERSHIP.

From a membership of forty-six in April 1915, we have grown today to a membership of over ninety. In the

State of Connecticut there are registered ninety-five hygienists, according to the latest report.

DENTAL HYGIENISTS IN SCHOOLS AND HOSPITALS.

We are pleased to note that Hartford has been industriously at work educating twenty women in the theory and practice of dental hygiene, chiefly for public school service, and we hope that within another year similar clinics will be established in Waterbury, New Haven, and New London, and interest awakened in many other cities and towns within the borders of our state. We are informed that the health authorities in New York City are training a number of women in dental hygiene to enter the public schools in September, as a nucleus for a much larger corps that will be increased in numbers as soon as educational facilities are established.

New Haven and Bridgeport have hygienists working in the hospitals, and this field of service is sure to prove of great value in aiding the physician and surgeon in the care of their patients.

STATES LEGALIZING THE DENTAL HYGIENIST.

Since our meeting a year ago two neighboring states, Massachusetts and New York, have inserted sections in their dental laws formally legalizing the dental hygienist. In incorporating these sections into their laws they have added educational requirements which will necessitate the establishment of schools where women may have access to education and training in this specialty. At the meeting of the Iowa State Dental Association in May it was unanimously voted to empower its legislative committee to incorporate into their dental law a section legalizing the dental hygienist, and recommending to the dental department of the State University of Iowa the establishment of an educational course for the dental hygienist. Connecticut was the first state in the Union to permit a registered or licensed dentist to employ an assistant, not examined by the State Commission, for the so-called operation of cleaning teeth. This section was incorporated in 1907.

AMENDMENT TO CONNECTICUT DENTAL LAW RECOMMENDED.

You are all familiar with the new section of our state dental law regarding the dental hygienist. When this section was drawn it was not feasible to insert an educational clause until the demand for this service was proved. As the time has now arrived when an educational clause may be inserted in the section of the Connecticut state dental law pertaining to the dental hygienist, I would recommend that a legislative committee of at least two members be appointed from our association to confer with the officers and legislative committee of the Connecticut State Dental Association regarding the advisability of such a change in the law, and, if deemed advisable by them, that a request be made that Section 12 of the present dental law be so amended as to provide for all educational requirements considered necessary for the dental hygienist.

RECIPROCAL INTERCHANGE OF LICENSES.

It would seem very desirable if new sections in dental laws pertaining to dental hygienists throughout the country could be somewhat standardized, so that certificates of registration in the various states would permit of reciprocal interchange, demanding of the newcomer merely a state registration, and excusing her from re-examination. This suggestion may not prove feasible, but the dentists may be able to solve the problem.

FUTURE AIM OF THE ASSOCIATION.

The dental hygienist is an established fact. She is here, filling her sphere of usefulness in the dental profession. It should be our aim as an association not only to spread our influence for the advancement of mouth hygiene and preventive dentistry, but to continually advance in our standard of education, and make our specialty an attainment not easily acquired.

Miss HOUSE moved that two members be appointed as the Legislative Committee to act with the members of the Legislative Committee of the Connecticut State Dental Association to amend Sec. 12 of the state dental law regarding the educational standard to be established for the licensure of dental hygienists. (Motion carried.)

Mrs. Newman resumed the chair, and announced as the next item on the program a paper by Dr. ELIZABETH BEATTY, Bridgeport, entitled "Operative Work in the School Dental Clinic as Preventive Dentistry," as follows:

Operative Work in the School Dental Clinic as Preventive Dentistry.

By ELIZABETH BEATTY, D.D.S., Bridgeport, Dental Corps, Bridgeport Public Schools.

Operative work in the public schools at once suggests a dental clinic of the reparative type; by reparative is meant the type of clinics that has been organized in various cities throughout the country to fill the teeth of the poorer class of school children whose parents cannot afford to pay for operative dentistry. These clinics have grown greatly in number. In some cities the clinic has been centrally located, while in others the work has actually been done in the schools. Just what progress these reparative clinics are making toward controlling dental caries I have not been able as yet to find out.

CLINICAL WORK IN SCHOOLS DIVIDED INTO THREE CLASSES.

In the city of Bridgeport a dental clinic has been established in the public schools for the prevention of dental decay. This work is divided into three parts: (1) The educational, which consists of classroom talks, stereopticon lectures, and literature with illustrations to be taken home to the parents by the children; (2) prophylactic treatments of the surfaces of the teeth, given at regular intervals for the first five years of the child's school life, and tooth-brush drills to teach the method of brushing; (3) the filling of the small cavities of the first permanent molars for the children in the first and second grades. It is this latter division that has been my field of service during the past year, and although there has been more work to do than one individual could accomplish, yet we have been able to prevent the future loss of many first molars by the early treatment of the small cavities.

It is the endeavor of the Bridgeport clinic to start all children on an equal basis at six or seven years of age, so far as their permanent teeth are concerned, and by educational and preventive means to try to prevent dental caries during the period of eruption of most of the permanent teeth, or until the children are twelve years of age. If, after starting upon such an equal basis, the child and his parents choose to ignore the proper care of the teeth, it then becomes their own misfortune.

Any and all children in the first and second grades who have small cavities in the first molars are eligible for this service; no distinctions whatever are made. This coming fall we shall have the services of another woman dentist to aid in this work, which we choose to call "preventive operative dentistry." It is believed that the city is in every way justified in doing such work to a limited degree.

GENERAL REPARATIVE WORK UNDESIRABLE.

Money appropriated by the city for a dental clinic, the main object of which is to fill and repair the teeth of the children, becomes an expenditure for a favored few. As it is impossible to fill all of the decayed teeth for all of the children in the public schools, a reparative clinic which takes care of the teeth of but a fraction of these children is introducing into the schools a charity—which should never be permitted.

The reparative type of clinic has a tendency to pauperize the child as well as the parents and tends to destroy character-building by giving the child a valuable service without any compensation or return effort on his part; in other words, giving him something for nothing. This principle is believed to be wrong, for a person soon loses his independence and self-respect if he is willing to receive benefits without adequately meeting the obligation.

If a wealthy philanthropist wishes to found a charity in his city and maintain such a clinic for the poor children, separate and apart from the schools, that is a matter for which the municipality is not responsible. It then becomes a recognized charity, and is accepted as such by those who profit by it. But it would seem better if the children who have their teeth filled, even at a charitable institution, were required to do some service in return, something in harmony with their age and physique—for in thus earning the service it would make for better citizenship.

DETAIL OF THE SCHOOL WORK.

It may be of interest to state in some detail how the operative work is accomplished. After the hygienists have been working a few days in a school they accumulate a list of names in the first and second grades who are in need of the dentist's services. Cards are made out for them and sent home to the parents by the children, calling attention to the teeth which need filling and stating that if they would like the work done in the school without expense to them to sign the card and return it by the child. We believe that we have no right to operate on any child without the parents' signed consent.

The dental outfit is a portable one, quite similar to those of the dental hygienists, which can easily be transported from school to school. One of the hygienists usually acts as an assistant, sterilizing the instruments and aiding when necessary, in order to facilitate the work. This takes but little of her time, and does not interfere in any great degree with her own work.

The dental chair is placed in unused classrooms, corridors, teachers' and tutors' rooms, or in any comfortable place where there is plenty of light. Practically all of the work is done with alloy, first lining the cavities with cement. Most of the children are tractable, and very little difficulty is encountered in doing the operative work in the school building. Sometimes they are a little nervous or frightened, perhaps, at first, and sometimes purely stubborn. Each child is dealt with accordingly. Usually a little exploring or the preparation of a single cavity at the first sitting will convince the child that there is no pain, and no reason for him to be alarmed, and thus his confidence is gained, after which the work is carried through with ease. The parents are usually very much interested in the care of their children's teeth, and most of the cards come back signed. Many are indifferent, while others seem to have the mistaken idea that the work is charity, and will not permit it to be done. An interesting phase of the work is the education of the parents in the care of their own teeth by the children.

EDUCATIONAL FEATURE OF THE SCHOOL CLINIC.

The talks at the chair aid considerably, as do those given by the hygienists. The children are told why their teeth and mouths should be kept in a clean and sanitary condition, how the tooth is attacked by decay, and why it is necessary to fill the cavities while they are yet small; and the pupils seem to absorb and comprehend what they are told.

The lectures given in the schools by Drs. Fones and Strang are most helpful, too, in driving home the necessity for caring for the teeth, the stereopticon giving simple mental pictures which make a deep and lasting impression upon the young minds. The supervisors and teachers aid greatly in securing the children and in chart and record work, as well as in giving the needed information as to health, parents, etc., of the child.

Quite a little time is consumed in making friends with the children and in gaining their confidence, because dental work for children, if done carefully and painlessly, progresses slowly; yet the records show an average of eighty-five to ninety alloy fillings each week, besides the extraction of many loose or abscessed deciduous teeth, and a number of treatments for the temporary relief of pain for the children in the higher grades.

DISCUSSION.

Dr. W. J. McLaughlin, Bridgeport, Conn. *Madam President,*—I enjoyed the paper very much indeed, and am sure that we will profit greatly by what we have heard, not only because of its importance but because it marks an epoch in the development of preventive dentistry. We have listened to practically the first report by the first operator in a preventive clinic, and to me that seems to be of importance. I rather like the speculative way in which she has treated the subject, and not confined herself to the operative side. Her comments on the development of this work from a charitable standpoint are well studied. We have proved by the inductive method that the clinic that is subsidized is after all not a benign clinic; it may be benign in its influence on the individual, but on the whole it is destructive, for we have found after experimentation with certain forms of procedure that they have their limitations, and it has been necessary to replace them with something that seems from the start to have a greater average of results. Today we have, in the preventive clinic in the schools, something that seems to solve the problem, and I am convinced that no sound argument can be presented against it. In fact, two years of experimentation prove that the results are what have been claimed for it, and I think that the future will see many cities throughout the country having such clinics and doing away with the old system of reparative work, which is merely a patch in connecting the quilt, as it were.

I am thus impressed the more at this time because of what we hear from men who have been experimenting along the line of the public dental clinic, and who give us an opinion based on a lifetime of experience. They tell us that certain conditions are not to be tolerated; that there are many cases of regret that certain things were done. The answer to their observation is this: That if years ago such a system as you ladies are interested in had been developed, perhaps they would not have made these observations nor have had any regrets that certain things were done. It is pleasing in this connection to me and to the older men, those who are looking for the truth, to hear and see the things you are doing, and draw our conclusions from what we have seen—namely, that in prevention there is something tenable to offset what has apparently been a mistake in the past. It has been well put that most of the progress of the world has been the undoing of things that seemingly were established, and that is the condition we face in dentistry today because of the observations of men who have been over the beaten paths.

I like Dr. Beatty's observations of the dental work as it is being carried on, and am glad to note that she is strongly in favor of preventive efforts rather than corrective, although in this, as in other innovations that must come from progress, we will have our little tribulations and antagonisms. Tennyson has said men may "rise on stepping-stones of their dead selves," and our dead selves, the stepping-stones of the future, may be the little antagonisms that come from the profession. I do not associate the lack of attendance at this time as an expression of that antagonism, but I would like to have seen more of the male members of the profession here today, because they constitute perhaps more than fifty per cent. of those who need education along this line. This question is allied somewhat with the spirit of the times, and I may make the observation that in all intellectual endeavors there are men who, seeking for truth, see the fault of the past and try to rectify it. The medical profession is doing it; we find it in the economic and sociologic life, and even in politics; and if there ever was a movement akin to progress it is this that has been developed out of dentistry—preventive medicine.

Dr. T. A. Ganung, Bridgeport, Conn. First I wish to congratulate Dr. Beatty on the presentation of the paper. I think we, particularly of Bridgeport, are very much interested in this subject.

When one is entirely in accord with a paper or a subject it is rather hard to discuss it, but perhaps there are a few points that I may bring out and emphasize somewhat.

When you consider that from 96 to 98 per cent. of the children under sixteen years of age are affected with dental caries, some quite seriously; that half of this occurs in the permanent teeth, and that 90 per cent. of the cavities that form in the teeth occur at the ages of from six to sixteen, you readily see that the time to start work with mouth hygiene is with the children. With the limited appropriation that most cities give to this work it would be impossible to undertake to fill all these cavities, but it does seem possible and feasible that we could take these first molars and fill the small cavities as they start in the teeth, and with the teaching that the children would get along with the hygienist's work, we could send them out of school with fairly good teeth, and with a knowledge of how to care for them in the future.

Just a word in regard to the importance of the first permanent molar. The first permanent molar, as you know, has the largest chewing surface of any tooth in the mouth, and plays a very important part in the development of the face and the development of the jaw for the accommodation of the other teeth that follow. During the course of eruption of the permanent teeth, many times the deciduous molars are lost before the bicuspids are ready to erupt, and we have nothing left to chew on but the first permanent molars. These teeth, as you know, decay very rapidly when they once start, and it is not long before there are large cavities with exposed and aching pulps, etc. When they reach that stage I feel that you have gotten on dangerous ground, and in these days of the radiograph, when we hear so much of the ills that may come from improperly filled root-canals, I sometimes think that for the sake of the future health of the child he would probably be better off to lose the tooth. I do not know that Dr. Beatty sees many of these cases, but I would like to have her in closing tell us the frequency with which cases appear with exposed pulps. I feel that the school work in Bridgeport as planned and carried out by Dr. Fones has been a wonderful success, and hope it may be the means of stimulating other cities over the country to take up the work along the same line.

Dr. Beatty (closing the discussion). Our chief aim is to put every child at the age of sixteen on an equal basis, and where we have exposed pulps we simply give them temporary relief, and the children are sent to Dr. Redell, the chief of the clinic; the teeth are then either filled or extracted. Simply preventive work is done in the clinics.

The next item on the program was the reading of a paper by Miss Ella Maher, New Haven, on "The Services of the Dental Hygienist in Hospitals," which here follows:

The Services of the Dental Hygienist in Hospitals.

By Miss Ella Maher, New Haven,
Dental Hygienist in the New Haven Hospital.

For some time past the authorities in charge of our hospitals have realized the necessity of dental service for many of the patients, and in some of the larger cities licensed dentists have been employed to do various surgical and reparative operations on the mouth and teeth.

Of late there has been a greater realization of the importance of cleanliness of the tooth surfaces of the patients in the hospitals, but just how this much-needed service could be accomplished has been a problem.

Those who have examined the teeth of the patients, especially of those in the public wards, know in what deplorable condition they are. It must be remembered that patients coming to a hospital, particularly the ward patients, are of a class in which care of the teeth has been almost if not entirely absent, and so, irrespective of what the medical or surgical complaint may be, the condition of the mouth will be extremely unsanitary. Large deposits of tartar on the tooth surfaces, congested gums, and food débris will invariably be found, and the teeth are badly stained. In many mouths pyorrhea alveolaris, with fistulas on the gums, showing abscessed teeth, are present. No physician or surgeon can look into such mouths without realizing that the septic conditions are a serious menace to the health of the patients, and would tend to retard recovery in case of operation or a period of illness.

DESIRABILITY OF ORAL HYGIENE IN THE HOSPITAL PATIENT.

As the patients are not under normal conditions, secretion is sluggish, and elimination is at its lowest point, therefore resistance is also at its lowest point. When a patient enters the hospital the first thing done is to cleanse the intestinal tract, yet no thought is given to the mouth, which is the gateway to that tract. The oral cavity still contains its toxins and poisons.

A well-known truth in medicine and surgery is that in order to treat a disease properly one must first find and remove the cause. Within recent years the part played by septic mouths in the actual production of many diseases has been becoming more and more strongly impressed upon the medical profession. A clean sanitary mouth is especially desirable in those surgical cases where anesthetics are administered, often preventing post-operative pneumonia, for the reason that the mouth being free from decomposing food particles and containing fewer and less virulent bacteria, there will be less danger of these entering the respiratory tract. And even after operation, when the patient is still in a very weakened state, there will be no opportunity for infected food particles to start decomposition of any fresh food that the patient may eat.

To employ dentists in the hospitals to perform this very necessary mouth hygiene work is too expensive a proposition for most institutions to consider, as there is too much of it to be done; but to employ women who are trained and educated in this specialty is both practicable and less expensive.

Of course such women, according to our laws, must operate under the general supervision of a dentist, but as most institutions employ a dentist for mouth surgery, the woman's work can be generally supervised and directed by him.

THE WRITER THE FIRST HOSPITAL DENTAL HYGIENIST.

As far as I know, my work as dental hygienist in the New Haven hospital is unique in that it is the first position thus created in a hospital for our specialty. At present my hours are from 8 A. M. to 4 P. M., with an hour for lunch. I have a half-day off every Thursday, and am allowed one full day each month. On Sunday mornings I report for duty at nine o'clock to make the rounds with the attending dentist, who inspects any special cases that have been assigned to me during the week, or to look over any cases I may have to attend to until his next visit. Dr. Elwyn R. Bryant, our attending dentist, also makes the rounds on Thursday mornings, when he does all necessary extracting; this is done in the operating-room. I live in the nurses' dormitory, have my food supplied, my laundry work done in the hospital laundry, and work at a specified salary, but I am not subject to the nurses' regulations. At present, to prove the value of dental prophylaxis, the work is done without charge to the patients, but there is no doubt that a fee should be required for the treatments.

Prophylaxis may be compared with radiographic work, which in its infancy, to prove its value, was also done free of charge in the hospitals, but for which a fee is now demanded from the patient.

One does not hear of a patient objecting to an X-ray fee, and so many patients are now asking for the prophylaxis treatment that there is no doubt they would be very willing to pay for this also. Strange to say, weak and sick as most of the patients are, almost all of them take to the treatment very readily.

One of my first experiences of discord was in a woman's ward. A patient, a woman whose oral cavity had been sadly neglected and which I was asked to clean, allowed me to examine her mouth readily enough, but when I told her I was going to clean her teeth it was another story altogether. She absolutely refused to let me touch them, saying that she was too nervous, and that it would hurt too much. Finally, after much coaxing I gained her reluctant consent to let me clean and polish her upper central incisors. They cleaned up very nicely, and when I gave her a mirror so that she might see how they looked, she was so surprised and pleased that she sheepishly asked if I would make the rest of her teeth look like these two. At that time, of course, she was merely thinking of the appearance of her teeth, but on going into her ward a few days later, she remarked to me upon the different taste in her mouth, and how much better her food had tasted since her teeth had been cleaned.

PATIENTS APPRECIATIVE OF THE WORK.

The patients are already realizing the good done by prophylaxis, and look on it now as a necessity, feeling very much slighted if not given treatment. The work in the New Haven Hospital is done at present at the bedside. This of course is not the most convenient method, especially since about four-fifths of the patients given treatment could be easily removed to a specially equipped room. The patient's bedside table is utilized as an instrument table, after first being washed with an antiseptic solution. Upon it are spread the instruments, a glass of warm water, a syringe, and a basin. I also carry with me a tin box somewhat similar to a cash-box, which contains iodin, cotton pellets, dental floss, linen finishing strips, sterilized gauze, orange-wood points, a box of pumice, and brushes and rubber cups to use with my foot-engine when the teeth are very badly stained. The patient is then instructed in the proper method of brushing the teeth and gums, and it is impressed upon him that the treatments and brushing are not only of value while he is in the hospital, but should be continued throughout life.

It is very unfortunate that there are still many hospitals where no toothbrushes are furnished to the patients, especially since these can be purchased so cheaply. Nineteen out of twenty people come to the hospitals with no toothbrush, and I am often asked by patients to buy them a brush when I go to the drug store. I believe that it should be compulsory in the hospitals for patients to use toothbrushes, and if they have none, a new one should be supplied to them and charged to their account.

FUTURE OUTLOOK FOR THE HOSPITAL DENTAL HYGIENIST.

From this brief description it may readily be seen how large a field the future will offer to women for dental prophylaxis in hospitals. The demand for women specially prepared for this work is created, and will grow; for that reason it is of special importance that women should be properly trained to do it. For the women themselves, as well as for the patients and all concerned in the work, dental prophylaxis in hospitals, because of the good results that can be accomplished by it, will be found to be work that is both satisfying and very much worth while. In order that we may have definite facts to prove the value of this work in hospitals, it will be necessary for the dental hygienist to keep records of her cases, and by comparison of the time of recoveries from illnesses with previous records in the hospitals, draw conclusions which may result in disclosing some interesting facts very favorable to this branch of service.

This will take time, for although the

impression is, at the present date, that the work is a benefit, it will be necessary to have records and data to prove it definitely.

DISCUSSION.

Dr. E. R. Bryant, New Haven, Conn. I have been interested in this work in the hospital, and you are to be congratulated in having such an interesting paper brought before you. If there is any place where work of this kind is needed it certainly is in the hospital wards; and the great benefit I see from the standpoint of the hospitals is that this *régime* of Dr. Fones can be carried out among children so that when they do come to the hospitals they will not be in such bad shape. Usually the dentist is looked upon by the class of people found in hospital wards as the man to steer clear of, and consequently when they come to the hospital they have had no training in mouth hygiene, because they have kept away from the dentist, and have only gone to him when they had abscesses.

As Miss Maher said, we are dealing with people whose power of resistance has been lowered by disease. For instance, in going over the wards and examining the mouths we find many broken-down teeth. If we make radiographs we find abscesses, almost all of the remaining teeth covered with tartar, the gums bluish in color, the blood sluggish in circulation, and pus exuding from pockets around the teeth. It has been a wonder to me that the patient has any chance whatever against disease when he is taking nourishment that is being mixed with the débris that is constantly in the mouth. There is a difference between the hygienist's work in hospitals and in private practice, in that patients in the hospitals are sick and those in private practice are usually well. It has been a great surprise to me, however, to see how quickly the majority of mouths of hospital patients respond to this treatment.

We had an interesting case recently of a young man of thirty-five who had been sent to the hospital after his case was diagnosed as rheumatism. His joints were all swollen, his muscles very painful, and he was running some temperature. The attending physician diagnosed the case, and in the report said the patient had a bad case of pyorrhea. I took exception to this and got myself into trouble. When Miss Maher came back from her vacation this was the first case she took up, and in a few days the mouth had become clean, the gums pink, pus all gone, and there was nothing for me to do except remove some diseased roots. Ten days from the time I last saw him this patient went home free from any trouble.

Many cases seem to clear up after you get out the diseased roots and clean up the mouth and get rid of the accumulation of food débris. I am hoping that when hospital authorities generally begin to realize, as they are doing somewhat in New Haven, the importance of clean mouths to hospital patients they will place in every hospital a corps of hygienists to take care of all the cases.

Dr. R. H. W. Strang, Bridgeport. In my association with hospital work during the last few years one fact stands forth pre-eminently as a great unsolved problem, namely, the care of the mouth in all classes of patients. It is the one greatly neglected field.

Routine hospital practice calls for the bathing of the patients, that the outer surface of the body may be relieved of dirt; laxatives are always given, that the intestinal tract may be cleared of waste products and poisons; but the filthiest area in the body, the ideal bacterial incubator, is simply treated with a mouthwash, and allowed to continue to discharge micro-organisms and pollute all nourishing pabulum given the patient.

Those of us who have had the misfortune to look into the mouths of the average hospital patients have had conditions almost unbelievable meet the eye. As the essayist has said, tartar in great masses clings to the teeth; spongy, bleeding gums are omnipresent; broken-down teeth and old roots lie scattered about the mouth; pus is oozing from the alveoli and abscess fistulæ; decomposing food lies packed in cavities in the teeth and in the interproximal spaces—and a mouthwash is prescribed to alleviate all of this!

Such mouths are of course influenced by the very condition of the patient, whose resistance is below par. We therefore find, particularly in those individuals who are in the medical side of the service, an aggravation of an already deplorably inflamed oral mucosa. Nowhere else in the whole body is there such an area of inflammation, with the exception of the diseased part for which the patient has come to the hospital to be treated. And if we could look upon that internal area I feel confident in saying that it would not present such a horrible picture of purulent irritation as the mouth cavity. Who then has a right to say that a neglected area of this character is not using up much of the vitality of an already subnormal system, and retarding the healing process elsewhere?

Who is to blame for such conditions? Both the medical and dental professions. The medical man has until recently been looking *through* the mouth instead of *into* it. At last he has awakened, and the demand for relief of these conditions by the medical fraternity is pressing. At present the pendulum has swung to the other extreme, and all sorts of diseased conditions whose cause is obscure are traced to tooth origin. However, better by far that this be so than that the physician continue his blind attitude of the past. The pendulum will fall to the center eventually, and humanity will be relieved of much suffering.

The dental profession is also much to blame. When one can look into the mouths of patients of dental practitioners and find conditions which simulate those found in our hospital cases, though perhaps not to such an extended degree, we feel justified in making the statement that a large percentage of the dental profession is not practicing and teaching oral hygiene. We have failed to realize the importance of clean, healthy mouths to the individual and to the community as a whole. Those of us who are connected with public institutions have not made insistent demands for mouth cleanliness. We have found conditions as described, have taken them for granted and have contented ourselves with them. I can say this very conscientiously, for I have been one of the offenders.

But to ease our conscience, let us say truthfully that we have had a reasonably good excuse for neglecting these conditions in institutional work, up to two years ago. No dentist could give up the time to do it himself; that stands to reason. Neither could the nurse in charge of the patient do much better than to give the accustomed mouthwash—she is untrained in mouth work, and her other duties are many and arduous; she was powerless. But two years ago a new profession was born—the *dental hygienist* stepped forth with a preparation that ideally fits her to enter the hospitals and other institutions and meet the emergency. In the future there can be no excuse for attending physicians or dentists of our city hospitals to neglect oral sepsis.

One of the important functions of the hospitals is to teach hygiene. We have not had this brought to our attention as forcibly as it should have been, because primarily in such an institution the thoughts are centered on disease and its cure. In this concentrated attitude we are apt to lose sight of our opportunity to teach the individuals under our care the great truths with regard to preventing sickness. Think for a moment of the tremendous impression that must be made upon the average ward patient by the extreme example of cleanliness that the hospital forces upon him. The daily bath, the clean beds, the carefully gowned nurses, the wholesome, clean food. These must leave an impression that is lasting in many cases. Then add to this the work of the dental hygienist, the cleansing of a mouth that has never before been cleansed, the teaching of the use of the toothbrush to the individual who has never used one, with the instruction that this is for home as well as hospital use, emphasizing the influence of a dirty mouth in causing disease, perhaps the very disease which has brought him to the hospital, and the importance of teaching others in the home this very thing. Some seed will fall upon good ground, and the influence of the hospital as an exponent of hygiene will be greatly increased.

As stated by the essayist, the work is in its primary stage. In every hospital where it is introduced there must be many months of patient educational and demonstrating service. It will be discouraging and unappreciated in many details, but that has been the history of every innovation at the time of its introduction.

But there are many in the medical as well as in the dental profession who have faith in this work, therefore you must do your part in these experimental years that this faith be unshaken. The reward will come with the results, and the demand for your services in all sorts of public institutions will be excessive. The New Haven Hospital is to be congratulated in being the first institution of its kind to give its patients the benefit of this treatment, and the essayist has rendered a distinct service to her profession as well as to the medical and dental professions in being able to meet the requirement of such a critical experiment and clearly prove it to be not only a necessary routine in hospital work from a hygienic standpoint, but also an important adjunct to curative treatment, a powerful preventive of secondary complication, and withal proves absolutely practical and compatible with hospital *régime*.

To those of you who are called in the future to a similar field my plea is, Be thorough, intelligent, enthusiastic, unselfish, and above all, physiological workers with one object in view, to demonstrate the great need of humanity for your services, and you will be a means of spreading throughout the whole country a propaganda that will do much to prevent and alleviate suffering among the masses in general. No profession has a greater calling than has this.

The next paper was by Mrs. T. A. Ganung, Bridgeport, entitled "The Work of the Dental Hygienist Regarding the Prevention and Control of Pyorrhea Alveolaris," as follows:

The Work of the Dental Hygienist Regarding the Prevention and Control of Pyorrhea Alveolaris.

By Mrs. T. Allen Ganung, Bridgeport.

Prevention. It is not my intention to attempt to describe the etiology of pyorrhea alveolaris nor to go into any detail as to this affection of the dental tissues. Such discussions are for the members of the dental profession, and although of interest to us, we are not qualified to scientifically discuss this disease. But as our work brings us in contact with these cases, we have a field of service in aiding the dental surgeon in the prevention of this disorder that is important, also in its control after surgical treatment by the dentist.

I think it is conceded by most observing dentists that pyorrhea alveolaris is seldom, if ever, found in mouths that are well cared-for. By well cared-for I mean having the calcareous deposits around the necks of the teeth removed at frequent intervals, keeping the surfaces of the teeth well polished, free from stains and accretions, and being reasonably faithful in the home toilet of the mouth, in the thorough brushing of the gums and teeth, and in the removal of food débris.

Some who have been afflicted with pyorrhea have informed me that they went regularly to a dentist twice a year to have their teeth cleaned, and that they were always very particular in brushing them, yet they have developed this disease condition in their mouths. The amount of tartar found around the necks of the teeth of these patients, especially upon the approximal surfaces, would lead me to believe that either the patient had been thoughtlessly mistaken as to the "fairly frequent" periods of cleaning, or that the dentist was pressed for time, and unable to thoroughly go over the surfaces of the teeth.

I have in mind a man who has been

practicing dentistry for over fifty years, and who for many years has been exceedingly careful regarding the removal of all deposits from around the necks of the teeth of his patients, thoroughly polishing the surfaces of the enamel, and always urging the faithful use of the toothbrush. He states that the only cases of pyorrhea alveolaris he sees in his practice are in the mouths of new patients.

There is reason to believe that if patients can be induced to come for treatments at intervals of not more than three months—two months' intervals being even better—to have all deposits carefully and thoroughly removed and the enamel surfaces thoroughly polished, being faithful in the home care of the mouth as to the use of the toothbrush—not only on the teeth but upon the gums as well—the use of the floss silk between the teeth and the rinsing of the mouth with lime-water, pyorrhea alveolaris is absolutely preventable.

When the public fully realizes the truth of this statement, there will be a much greater demand for our services in aiding to prevent this much-dreaded condition.

Control. When patients afflicted with pyorrhea present themselves to the dentist, the case is usually first referred to me for the removal of all deposits from around the necks of the teeth and a thorough polishing of all exposed surfaces. Careful instructions are given at the washbowl regarding the brushing of the teeth and gums, and flossing, and as the gums at this time are in a soft and congested condition special emphasis is laid upon the fact that they must not be brushed too strenuously or with much pressure, for fear of abrading the tender surfaces and making them sore. After the patient has had such preliminary treatment and has been given, say, a week's time to relieve the congestion around the borders of the gums by faithfully plying the toothbrush, the work of the doctor in his surgical operation on the roots of the teeth is greatly facilitated.

After the several sittings necessary to thoroughly complete the instrumentation the case is again referred to me for another drill at the washbowl with the toothbrush. When the deposits have been thoroughly removed from the roots of the teeth, and the gums have been artificially stimulated by this system of rotary brushing, the pus soon disappears, the pockets heal up, and the case resolves itself into one of what we might term control.

Such mouths are apparently cured, and if the patient will follow a definite system of prophylaxis there does not seem to be any return of the disease. However, I believe that these patients are far more susceptible if they again neglect their mouths than are others with unsanitary mouths who have not yet developed pyorrhea.

To sum up, our work as hygienists is very important in the prevention of pyorrhea alveolaris. It is important to clear the field for operation for our employer, and after he has finished with his surgical treatment, our instructions and training regarding the home care of the mouth and the subsequent surface treatments for the control of the disease are equally important. I think we cannot emphasize too strongly the necessity for the home care of the mouth. The patient should be impressed with the fact that the major element of control lies with himself and not with the hygienist.

In presenting this paper it is hoped that there may be some thoughts that may prove helpful to the members of our association.

DISCUSSION.

Dr. A. C. Fones, Bridgeport. It is not my intention to give you a dissertation on the subject of pyorrhea, and yet I wish to speak of a few facts that should be again impressed upon you, because it is in your power to prevent pyorrhea alveolaris. It is also in the power of those of you who are in private practice to greatly aid your employers in their treatment of this disease. The question has been asked of me again and again, "How far may these dental hygienists go in their instrumentation? Have they the right to do any surgical instrumentation in pyorrheal cases? Can they curet and remove the deposits on the root of a tooth when pus is discharging, and thoroughly clean out the pocket with instruments? Do you expect that, or even have they the privilege to do that?" Up to the present time you have no legal right to do surgical instrumentation. The time will come when your education in this specialty will be so far extended that you will be privileged by law to operate upon and treat this disease condition, and the dental profession will be glad of your services and aid; but please remember that you now have no legal right to cross the borderline into the treatment of disease, and it is not reasonable that you should. If any hygienist should overstep her bounds and get into legal difficulty, she need expect no aid from me. Stick to your specialty, and you will be of great service without transgressing into other fields.

Mrs. Ganung has divided the subject of her paper into two aspects, first that of control and prevention of pyorrhea, and second the help and aid the hygienist can be to her employer. First let us consider control and prevention. You must have been forcibly impressed this morning with Dr. Noyes' lecture and the slides illustrating the intimate relation which exists between the blood supply of the peridental membrane, the alveolar process, and the gum tissue, showing how important gum-brushing is in maintaining a perfect circulation through these tissues; and again, the slides showing the subgingival space, how the presence of tartar around the neck of a tooth, holding food débris and millions of bacteria, would be an irritant and a menace to the soft tissues that would threaten the integrity of the dental ligament. Pyorrhea alveolaris is not a disease of the alveolar process. The fact that the extraction of the tooth always cures pyorrhea shows that it is purely and simply a disease of the peridental membrane. It has its side-lights; the alveolus is usually involved and to a certain degree the gum tissue and the cementum, but it is almost entirely a disease of the peridental membrane. As long as you are able to keep the soft tissues around the necks of the teeth in a state of health and free from irritation, you will be able to prevent the initial cause of pyorrhea. This means the frequent removal of every particle of tartar from around the necks of the teeth on all surfaces, labial, lingual, and approximal—which is, as you all well know, a very painstaking operation. These surfaces must also be kept highly polished and the gum tissue well stimulated by brushing. You cannot control, except indirectly by suggestion to the dentist, the irritation produced by ill-fitting crowns and bands.

Crowns and bands under the gingivæ, cutting into the soft tissues, eventually mean points of ingress for bacteria and an infected peridental membrane. Lack of proper contact points, where fillings do not come together, permitting the wedging of food into the interproximal space, may also prove to be an exciting cause of this disease, and it is your duty to call the attention of your employer to these conditions. Your main work is to see that the necks of the teeth are kept free from salivary and serumal calculus.

Let me speak now about office practice, or of how much aid you can be to the dental practitioner in his handling of the cases of pyorrhea. As a rule, when patients who are suffering from pyorrhea present themselves, the teeth will be badly stained, and large calcareous deposits will be found on the necks of the teeth. If the dentist attempts to operate on these mouths at once, he must spend a great deal of time in the removal of the superficial deposits—by that I mean all above the gum line. Therefore it would be well, when a patient first comes for treatment of pyorrhea, for the dentist to tell him that he would like to have the mouth cleaned up—the salivary deposits and stains removed—so that he may better see the pyorrheal conditions. In other words, have the field of operation prepared. He could say to the patient, "I have a trained dental hygienist in my office who can do much of this preliminary work in the removal of stains and superficial deposits, and who will train you in the use of the toothbrush afterward. Your mouth will in a short time be in good condition for my surgical work upon the roots of the teeth." You can readily see what an important part you take in this preliminary work, especially as to the instruction in brushing the gums and teeth. I wish to emphasize the fact that you will never be able to make a complete success in your work unless your employer will supply toothbrushes so that you can give instruction in brushing at the washbowl. Frequently two or three lessons at different sittings will have to be given before the patient will acquire the art of thorough brushing—and in order to teach others you must know how to brush the teeth and gums yourself.

Merely instrumentation and polishing and telling the patient to use the toothbrush, floss, and lime-water is not prophylaxis. It is but fifty per cent. of your work. The personal instruction in the home care of the mouth is exceedingly important. Gum-brushing is the one most important thing I know of for the prevention of pyorrhea, and also for its control after instrumentation. After the dental surgeon has operated on the roots of the teeth, the patient should again be referred back to your hands for further instruction and directions regarding the brushing. Sixty per cent. of the teeth that are lost in adult life are lost from pyorrhea, but by your care in establishing healthy conditions in the mouth you can and will prevent much of it.

Children rarely if ever have pyorrhea, because in youth the peridental membrane is thick, highly vascular, and very resistant. As people grow older the membrane is encroached upon by a thickening of the walls of the alveolus by the osteoblasts, and new lamellæ being formed on the root of the tooth by the cementoblasts. The encroachment on the membrane gradually makes it thinner, and it is during this process of growing thinner in neglected mouths that infection so readily takes place at the gingival border.

In childhood the great battle is with dental caries, in adult life with the peridental membrane. The neck of the tooth and directly at the gingival border is the vital part, and there lies your great field for service.

The meeting then adjourned until the evening session.

WEDNESDAY—*Evening Session.*

The meeting (concluding the joint sessions of the two associations) was called to order by the president, Mrs. Newman, at 8.30 o'clock.

Dr. A. C. Fones introduced the speaker of the evening, Dr. F. B. NOYES of Chicago, who gave a lecture on the subject of the "Importance of the Proper Care of the Peridental Membrane in the Practice of Oral Prophylaxis," after which the meeting adjourned until the morning session.

THURSDAY—*Morning Session.*

The meeting was called to order Thursday morning at 9.30 o'clock by the president, Dr. Prentis.

Dr. Prentis introduced as the speaker of the day, Dr. NEWELL S. JENKINS, New Haven, who presented a paper, entitled "The Influence of American Dentists upon Europe."

[This paper is printed in full at page 178 of the present issue of the COSMOS.]

DISCUSSION.

Dr. W. A. Spring, New York. (Dresden.) The essayist has given us an interesting and unique description of some of the pioneers of American dentistry in Europe—such a description as probably no other living man could give. He was more than a friend of these men he described, and therefore he was a pioneer *with* them, and is the connecting link between that time and this. I consider that we are very fortunate in having the opportunity of this interesting and inspiring description of these men.

In the presence of the essayist and in the time allotted to me I can scarcely begin to mention the names of some of these men whom I have known, to say nothing of telling you about them. I cannot refrain, however, from mentioning the name of Davenport, and what that name has meant in Europe.

Dr. Kirk Davenport began practice in the office of Dr. Jenkins, and after two years began independent practice in London. His success was phenomenal; his broad grasp, his skill, and wonderful ability soon secured for him one of the greatest practices in London, and in his death the American Dental Society of Europe mourns one of its greatest members, and Europe, and I may say America, has lost one of the greatest men in the dental profession. Dr. Isaac Davenport, Kirk's elder brother, practiced in Paris in those same days with the pioneers Dr. Jenkins has mentioned, and still practices there. Even before Dr. Angle brought out his system of orthodontia, Dr. Davenport described correct occlusion of the teeth as an essential to orthodontia. That today seems an axiom, but I can remember the time when dentists simply straightened teeth. His prominence is so great that he is known all over Europe.

We have with us today in this room another man who was a pioneer in those other days, and whose reputation on account of his skill, his breadth of understanding, extends all over Europe—Dr. Bogue.

Dr. Wm. Davenport—and also Isaac—will be known throughout time because of the wonderful work done in France for the wounded. In the beginning of this great conflict that is now raging, Dr. Wm. Davenport devoted his entire time to that work. Dr. Hayes has devoted his entire time to the work of the American Ambulance Hospital in Paris, and I may say that the work of these men has created a wonderful feeling for American dentists. We have seen described some work they have done in the dental journals, but the breadth and scope of the work that these men have done is something that we cannot grasp.

Dr. Merrill of Cologne is another man who has been quite prominent in Europe. Several years ago he took up the recreation after office hours of building houses. After building several for himself, he began to build houses for others, and now a whole suburb of Cologne is full of houses that Dr. Merrill has built, and they contain in addition to the original ideas a great many American features, including in every house a first-class American vacuum cleaner.

Dr. Webb of Rome is another man who has wonderful ability. His modesty and high ideals have given a name to American dentistry of which we may all be proud. He has treated the royal family for a number of years both in Italy and in Montenegro, and was awarded a title for his services. Dr. Bödecker is doing original work, and has made for himself a name among the scientists of Europe.

I cannot refrain from telling you something on this occasion of Dr. Jenkins himself, what Dr. Abbot meant to him, and what he meant to me—not only to me but to a great many others. His office and home were always open. Dentists from all over Europe were constantly availing themselves of the opportunity to be present in his office and in his operating room for hours, profiting by his methods and by his kindly advice. When Dr. Jenkins was seventy years of age, the Paris Dental Club gave him a banquet and on that occasion seventy-eight gentlemen assembled to do him honor. When you consider that representatives of native dental societies from Great Britain, Sweden, Germany, Austria, Italy, France, and Spain were present, and presented to Dr. Jenkins medals of honorary membership in the societies which they represented, I feel that it was American dentistry also that was being honored on that occasion. It was my pleasure and privilege at that time to inform Dr. Jenkins and the other gentlemen present that the King of Saxony, in recognition of his services to dentistry, had given him the title of Geheimer Hofrat (or "Privy Councillor"). It was a unique occasion, and American dentistry was signally honored by the whole of Europe at that time.

As I said before, I have enjoyed this essay exceedingly, and I congratulate Dr. Jenkins on its presentation. I cannot agree with him, however, that these great things have begun to wane. I prophesy on the contrary that the influence of American dentistry will endure forever—will always be like a bright star shedding light upon the whole world.

Dr. James McManus, Hartford. I feared that for the first time in fifty-three years I might not be able to attend this meeting, and one of my great desires to be here was to hear this paper by Dr. Jenkins. It has no doubt been very interesting to you all, both young and old, but there are few here who can begin to appreciate and enjoy the entire paper as I can. That may sound egotistic, but it is not. I happen to have known personally, with the exception of one or two, all the men he mentioned. I knew some of them by correspondence before I attended the great gathering in London in 1881, and met them there, and later at the meeting of the American Dental Society of Europe. When I left these men in London I did not intend going farther than Paris, but there Dr. Williams of Geneva, an American, and Dr. Terry of Milan, induced me to take the trip to Weisbaden, and attend the meeting of the American Dental Society of Europe. I had a most delightful time at that meeting, because that year the president of the society was Dr. Crane, who was a native of Hartford—his family, his father, uncle, cousin, and brothers lived in Hartford. I had the pleasure of being made a member of the society, and cannot begin to tell you how I enjoyed that meeting and the great banquet that was given at that time to the members and guests of the society in Weisbaden. I recall another American dentist, Dr. C. O. Hall, who was in the office with me as a student—we were students together for six years, and then he went to the Baltimore College and was graduated, then went to Europe and practiced in Nice for a number of years. One of my pleasant recollections was when Dr. Hall accumulated a good fortune and decided to give up practice; he wrote me to come and take his place in Nice, which I did not see fit to do because I have fared pretty well in Hartford. He was one of the leading dentists in Europe, and a splendid operator.

I knew most of the men Dr. Jenkins has mentioned, and realize the great influence they have had in Europe and on dentistry for the good of the profession, and it has been a pleasure and delight to me to sit here and listen to this paper by Dr. Jenkins. I feel that we are all grateful to him, and that this is a paper that will go down in the history of dentistry as one of the most delightful reports of the influence of American dentistry on Europe that we have ever had. I congratulate Dr. Jenkins, and am very glad of the pleasure of having known him for so many years.

Dr. Jenkins (closing the discussion). I only wish in closing to express my deep appreciation in having the honor of saying these few words to this renowned society. It is appropriate that this address, describing something of what has been done by your colleagues in Europe, should be made to you because the whole world stands indebted to the State of Connecticut for the dentists whom she has produced. When we think of such men as Wells, Riggs, McManus, Strang, and Gaylord, and the brilliant younger men who are practicing now so successfully, one can only say, as has been said in one of the addresses presented at this meeting, that the whole dental world is under deep obligation to the state of Connecticut.

I wish to thank Dr. Spring particularly for his able remarks and for referring so kindly to me; but especially I wish to thank him for mentioning some of many of our colleagues who have distinguished themselves in Europe, to whom the limits of my address did not permit me to refer. I thank you, Mr. President.

The next order of business was the installation of the newly elected officers for the ensuing year, after which the meeting adjourned until the next annual session.

Eastern Association of Graduates of the Angle School of Orthodontia.

Annual Meeting, held in New York City, May 5 and 6, 1916.

(Continued from vol. lviii, page 1417.)

FRIDAY—*Afternoon Session.*

THE president, Dr. Kelsey, introduced as the next speaker for the afternoon session Dr. H. C. FERRIS, New York, who read a paper entitled "A Study of the Normal Movement of the Permanent Teeth during the Course of Eruption." Dr. Ferris presented in his essay surveys of consecutive models made during the transition period from the deciduous to the permanent denture, showing the relative positions of the permanent teeth, and illustrating the value of the geometrical method in the study of developmental changes.

The society then held a business meeting, after which motion was made and carried to adjourn until the evening session.

FRIDAY—*Evening Session.*

The meeting was called to order by Dr. Kelsey at 9 P.M.

Dr. Kelsey introduced as the speaker of the evening Dr. GEORGE E. DAWSON, Springfield, Mass., who read a paper entitled "Atypical Development in the Light of Correlative Variations."

[This paper is printed in full at page 171 of the present issue of the COSMOS.]

DISCUSSION.

Dr. E. A. Schumann, Philadelphia. Let me say first that I have greatly enjoyed the broad philosophical presentation of this subject which we have just heard from Dr. Dawson. The whole question of anomalies and malformations of the body, whether they be of the mouth, jaws, or viscera, or indeed of the functioning brain centers themselves, fall into certain very easily separable groups. Evolution, as you know, holds as one of its principles that every animal form resembles at some point in its development all those ancestral forms which have gone before, and any arrest of development at any time during the formation of structure, or at any time in the embryonic period of development of the animal, will cause the part in which the arrest of development has occurred to resemble the corresponding part in some ancestral form.

That sounds involved, but let us apply it, for example, to the tissues of the mouth. We all take it for granted that man has developed slowly upward by the process of evolution, passing in turn through the stages of reptiles, birds, etc., and lastly up through the anthropoids. Let us take man's relatives from the higher mammals—the carnivorous animals, for example—and compare briefly for a moment the functions of the mouth. We know that these functions are (1) to provide entrance to the alimentary canal, and (2) to provide for the mechanism of mastication and swallowing of food and for the supplying of that food with proper chemical constituents during the period of mastication. Then the mouth has to furnish the place of housing for the tongue and oral glands, and to form a resonance chamber in order that voice sounds may be projected, and also to furnish an accessory avenue to respiration.

Let us take these same functions in higher mammals—cats and dogs, for example—and here we have at once a change of function of the mouth as an offensive weapon. These mammals must have heavy canines for seizing prey, and they must have heavy alveolar processes in order that the teeth may not be broken loose by the force of leverage required in carrying heavy animals. They must have rugged, bony conditions for the attachment of the great muscles which furnish the motive power for the jaw. On the other hand, as the voice sounds are not developed, a resonance chamber is not necessary. The tongue is thin and flat in all carnivora, and therefore the mouth chamber need not be large enough to contain a very heavy, thick tongue as in man.

Now let us see what we have in certain cases of dental deformity in mouths in man. We have first a group of cases in which the conformation of the mouth is singularly similar to that found in lower mammalian forms—flat, narrow, straight dental arches, the teeth perpendicular, heavy canines, projecting lower jaw, and a thin, flat tongue. In such cases there is usually no lack of muscular development. These are people with heavy muscles; they may be micro-cephalic in their mental development, and these are distinct evidences of reversion to the lower form; in other words, at some time in the embryonic life of these individuals there has been arrest of development in the mouth parts, and if that arrest of development continues, these resemble the ancestral form of higher mammals.

In another group, while we may have, curiously enough, the same characteristics, yet in this second group we have arrest of development, as Dr. Dawson stated, not of the mouth alone, but of the entire individual. There are cases which are due to some defects in the family itself, to some defect not in the individual whom we are discussing, but in the father or grandfather; and these are the cases the treatment of which Dr. Holmes so well said must begin with the grandfather.

Then there is a group in which fetal diseases previous to birth—that is, the parent being afflicted by some form of disease, tuberculosis for example—affect the formative cells and cause some form of defect in the mouth. It is in the division of these cases into groups having similar primary causes that I think the work of the future lies with regard to their treatment by orthodontia—that is, in the line of preventive orthodontia. I am interested in preventive orthodontia, and that opens up the question of antenatal pathology, related, as I said, to the treatment of the grandfather.

Dr. H. C. Ferris, New York. We have had tonight an intellectual treat. I am at a loss to know how to discuss the paper as it applies to our practice of orthodontia. To discuss it technically I am totally unable, but applying it practically to our everyday routine, I cannot help but refer to a practice that has arisen rather from the monetary than from the scientific standpoint. We have fallen into the method of procedure of the observation of our patients after treatment from protection to ourselves, rather than from any real scientific reasons for protracted handling of the cases. I mean by that, that after years of experience, in order to insure good results in orthodontia treatment in a child six or seven years of age, we have found it advisable to keep that child under observation until the eruption of the second molars. Many of us treat these cases under a contract arrangement with the patient from the financial standpoint. We treat the case for two years and we practically finish the treatment or movement of the teeth—but, following the principle laid down by the essayist, by continued observation we are really treating the entire system, and by re-establishing function of the mouth we are re-establishing function of the whole organism, and obtaining a practically permanent result by our treatment.

It has been my practice for a number of years to hold all of my patients under a contract, to protect myself, and as I said it has been as a matter of self-protection rather than any scientific basis upon which I have been operating. I feel now that it is of inestimably greater value to the individual that we keep up that observation, so that the patient may not get away from the influences that we have been exerting to move the teeth and to retain them in the positions in which we have placed them. The essayist has opened to me a vast field in a concrete form which will stimulate me to devote many hours of study in that line.

Dr. Dawson (closing the discussion). I have nothing at all to add excepting to express my thanks for the cordial reception of my little contribution. Naturally, I have grown into this general view of the relations of all parts of the human organism, and for the matter of that, the human mind in connection with the human organism. I feel that this principle of the relationship of the different structures and different functions of the human organism is the principle that underlies not only all regenerative processes in the cure of mental and physical disorders, but the principle that underlies all effective education, and all effective control of life everywhere. We have generally been entirely too fragmental in our view of life. In our division into specialties we have seized some detail and devoted our efforts particularly to that; and so in education, one group of specialists are concerned in some particular aspect of educational questions and have thought to regenerate life from that.

We are getting now to the point of view, as the outgrowth of modern science, where we attempt to see life as a whole, where each of our specialties is simply a kind of avenue to the whole life, and whether physicians or dentists or psychologists, or whatever we may be, our problem is the whole organism, and not only the whole organism but the whole mind. I am very glad to have had the privilege of meeting with you, and very grateful for the courtesy of your attention.

Dr. R. B. Stanley. Now that the discussion is closed I would like to thank Dr. Dawson for his presentation, and I think I voice the sentiments of the whole society when I say that I think this is one of the most masterly presentations that we have ever had in the history of our society.

For many years I have felt personally that my work was but one-quarter completed when viewed from the structural standpoint. I felt that in proportion as function was established would success or failure crown my efforts, and I am more convinced tonight than ever that if we proceed along the line he has given us we will come nearer the goal of success than ever before.

Just about this time we have had presented to us a scheme of treatment which considers the structural aspect alone, and in connection with that question we have been asked in relation to this scheme, What is taking place as the result of structural development? I think what has been given us tonight answers the question very effectively, and it behooves every member of this society, when Dr. Dawson's paper is published, to study it thoroughly, and I think we shall find that there is a new field of work open to the orthodontist.

I wish again to thank Dr. Dawson for his paper, and also Dr. Johnson, who is, I think, responsible for getting Dr. Dawson to appear before us tonight.

The meeting then adjourned.

SATURDAY—*Morning Session.*

The meeting was called to order Saturday morning at 9.30 o'clock by the president, Dr. H. E. Kelsey.

The President announced as the first item on the program for the morning session a lecture by Dr. J. V. MERSHON, Philadelphia, Pa., on the subject of "Case Histories which Illustrate the Integrative Action of the Nervous System."

The next item on the program was the reading of a paper by Dr. JAMES G. LANE, Philadelphia, Pa., entitled "Study of the Dynamics Involved in the Etiology of Malocclusion."

[This paper is printed in full at page 149 of the present issue of the Cosmos.]

DISCUSSION.

Dr. G. W. Grieve, Toronto, Canada. One thing that I have noticed in class III cases is that we have abnormally large tongues. I have only made observations along this line within the past few months, and I would like to ask Dr. Lane if he will in closing the discussion tell us whether he thinks the majority of these cases of large tongue have been due to irritation or natural growth.

Dr. F. T. Murlless, Jr., Hartford, Conn. My views with regard to this subject are very much the same as Dr. Lane's, and I rather envy him in having stated the matter in so concise and definite a form. I agree with what the essayist says about class III cases, and am on record to that effect before this society. I think that along with the projected tongue as a disturbing factor, the mandible should also be mentioned, as it may be pushed forward quite a distance without even parting the lips, in the effort to relieve the tension due to pharyngeal irritation.

Dr. L. M. Waugh, New York. I have been deeply interested in this paper. The impression might easily be gained from the paper that Dr. Lane has put in the background the biological factors which tend to control and influence growth, but I think from what Dr. Lane has said previously he is not disregarding the importance of these factors at all. I believe his summing-up of the subject under two conclusions is correct: First, that durability of the work is the only standard by which we should measure success; second, that its durability or permanence will be in proportion as we have harmonized the mechanical forces.

I have, as many of you know, been interested in the study of the temporo-mandibular articulation in relation to the condyle path, and I would like to ask if Dr. Lane does not think that the pressure of the tongue in reshaping the arch is not also sufficient to carry forward the temporo-mandibular articulation. We know that surrounding the head of the condyle we have a capsular ligament which is dense, and which holds the head of the condyle in the glenoid cavity, and we have, interposed, an inter-articular fibro-cartilage, the anterior portion of which receives in many cases some of the fibers of the internal pterygoid muscles which are brought into play in drawing the jaw forward, and I have wondered if the pressure of the tongue would not also influence the temporo-mandibular articulation.

I was impressed with the change that was brought about in the relation of the jaws in the case of my own little boy a year ago, when he had tonsillitis. The antero-posterior relation of the molars was normal, but in an effort to breathe, the mandible was carried forward considerably to increase the breathing-space in the throat, and I have wondered whether or not these plastic tissues in the temporo-mandibular articulation may not have been involved.

Dr. B. W. Weinberger, New York. Dr. Lane has said that most of the class III cases are caused presumably by the tongue as well as by adenoids and tonsils. What about those cases where we have evidence of the protrusion or retrusion of the mandible before birth—and there is a large proportion of these that occur at or before birth—and where there have been no dynamic forces such as he describes? We have these conditions in early embryonic life, as I showed you last year. Certain amnion pressures have been proved by Professor Jansen to produce displacement of the mandible and incidentally displacement of the maxillæ. Naturally these influences continue through embryonic and fetal life, later resulting in class II or class III cases. Where we have difficulty in overcoming these conditions and are not able to hold them even by retention, there must exist a deeper and earlier factor than the forces he mentions. Dr. Lane, how would you explain these conditions at this age in the light of the theory advanced in your paper?

Dr. H. C. Ferris, New York. I would like to ask Dr. Lane if we should follow the conditions that exist when we undertake our work, and disregard any possible change in the tissues of the jaws that tooth measurement would indicate in the treatment of the arch, or whether we should remove some of the teeth to take care of these abnormal muscle actions that produced the original condition. Must we modify our principles of biology in order to satisfy the at present existing dynamic conditions?

Dr. Lane (closing the discussion). Dr. Grieve asked about the effect of the large tongue. I explained in the paper how a large tongue must have more space, and is more forcible in producing that space than possibly anything we can put in the mouth in the way of appliances.

Dr. Waugh asked a question with regard to the effect of the mouth conditions on the temporo-mandibular articulation. This question has been answered by others, but not satisfactorily, as far as I am able to determine. As I said in the paper, the forces would affect the tissues most that offered the least resistance, and that would apply in the temporo-mandibular articulation.

Dr. Weinberger asks about cases of malocclusion at birth. I do not believe it is possible for any man to determine at birth what would really be malocclusion or malrelation, and particularly so at the age Dr. Weinberger mentions—in the second or third week of embryonic life. At that time the arch would not have sufficient form for anyone to say that malrelation is present.

Dr. Ferris asked if we must modify our present treatment. If what he designates "present treatment" is not in conformity with the principles of dynamics, we shall have to modify it. In so far as our present treatment is antagonistic to the dynamics involved, it will spell failure if we persist in its use. Measurements of teeth can be a means of determining the length of the arch from molar to molar, but it cannot be a means of determining the width, shape, altitude, etc., of dental arches regardless of environment over which we have no control.

The next item on the program was the reading of a paper by Dr. E. A. SCHUMANN, Philadelphia, Pa., entitled, "The Development and Anomalies of the Maxillæ from the Biological Standpoint."

[Dr. Schumann's paper was published in the DENTAL COSMOS for November 1916, vol. lviii, p. 1213.]

The society then adjourned until the next annual meeting.

Pennsylvania State Dental Society.

Forty-eighth Annual Meeting, held at Pittsburgh, Pa., June 27, 28, and 29, 1916.

Tuesday—*Morning Session.*

The forty-eighth annual meeting of the Pennsylvania State Dental Society was called to order on Tuesday morning, June 27, 1916, at 10 o'clock, in the Carnegie Music Hall, Pittsburgh, by the president, Dr. H. E. Friesell, Pittsburgh.

Rev. Samuel Black Linhart, Pittsburgh, invoked the divine blessing on the deliberations of the association.

William J. Holland, Ph.D., LL.D., Pittsburgh, ex-chancellor of the University of Pittsburgh, on behalf of the city of Pittsburgh, welcomed the society, as follows:

Address of Welcome.

Gentlemen,—I deem it a high honor to have been invited to perform the gracious duty of welcoming you to the city of Pittsburgh.

On behalf of your hosts I wish to say in the first place that we welcome you gladly because of what you are and of that for which you stand. We recognize the important place which you occupy in the social organism, the indispensable nature of the services which your profession renders. I sometimes wonder how our forefathers, who lived two or three centuries ago, managed to survive the agonies they must have endured without the modern appliances for relief. I had an offending tooth some time ago, which nearly drove me to distraction. At last I took the advice of my dentist and resolved to "have it out." He took me to one of his brethren, who seated me in a chair and gave me gas. I had a most delicious experience. I was seated in a carriage, beside me a loved sister and her beautiful child. We were driving through broad fields of ripening wheat, over which now and then purple shadows were cast by the sun-rimmed clouds. Before us stretched the wide expanse of the ocean beyond the fields. It was a glorious and exultant summer day. All at once the vision vanished. It was gone—so was the toothache and the tooth. I know I am going to live longer than I would have had the chance of otherwise living if I had not taken the good advice of a friendly dentist. We hear a good deal about the increase of the longevity of the race. I am quite sure your profession is doing as much, if not more, than is being done by any other in increasing happiness and adding length to human life.

Another reason why I am glad to be permitted to welcome you on this occasion is the fact that it was my pleasant duty a number of years ago to take an active part in establishing the College of Dental Surgery in the University of Pittsburgh, of which I was at that time the chancellor. One of the quiet satisfactions of my life has been to see how this school with the lapse of years has grown and constantly become more and more efficient. In nothing, perhaps, has the university been more fortunate than in having had at the head of its College of Dental Surgery the eminent man who will presently deliver the Presidential Address before your association. Alert, energetic, methodical, learned, skilful, kind of heart, a most successful teacher and organizer, always laboring in season and out of season not only for the great school at the head of which he stands, but for the uplift and advancement of the great profession which he adorns.

Pittsburgh is proud today of its College of Dental Surgery, ranking second to none in the world, and is proud of its gifted and accomplished dean, your president, Dr. H. E. Friesell.

And I am happy, as I welcome you to Pittsburgh, to stand on the platform of this institution, to the service of which I have been privileged to give many laborious years. As a paleontologist the study of odontology has necessarily occupied much of my time and attention. In many cases practically all we know of the extinct animals of the past is learned from their teeth. While we find no evidence of "bridge work" or "crown work" among them, we bridge the abysses of the past of living things by using their teeth as stepping-stones, and count our labors crowned with success when, by the help of a few molars or canines which have escaped the wreck of time, we are able to conjure up a vision of the life which was, before our coming was suspected.

You will find on the second floor of the museum a case, the label of which is "A Chapter on Teeth," in which you will see displayed typical examples of the teeth of various classes of animals. All through the museum, especially in the exhibits of comparative anatomy and paleontology, you will find opportunity to study the teeth of both living and extinct reptiles and mammals.

On behalf of the University of Pittsburgh, on behalf of the Carnegie Institute, on behalf of my fellow townsmen, the citizens of "no mean city" but today one of the foremost industrial centers of the civilized world, I extend to you a soulful welcome. Welcome, thrice welcome, to the city of Pittsburgh!

Dr. S. P. Cameron, Philadelphia, vice-president of the society, responded to the address of welcome, as follows:

Response to Address of Welcome.

Mr. President, Dr. Holland, Members of the Pennsylvania State Dental Society and Guests,—It gives me great pleasure to have the honor of responding, on behalf of this society, to such an appreciative and welcoming address.

We come here this morning to carry out the program which has been prepared for this the forty-eighth annual meeting of the society. No one here can fail to recognize the zeal and enthusiasm on the part of the members of each committee in their untiring efforts to present to this meeting such an interesting program throughout.

The second annual meeting of this society was held in Pittsburgh on June 21, 1870, and not again for thirty-seven years was it possible to get the State Society all the way over the Allegheny mountains and down into Pittsburgh.

An attempt was made in 1901 to hold the thirty-third annual meeting here, but that failed because there did not seem to be adequate accommodations for carrying on the meeting. At least this was the final conclusion of the committee after they had made a thorough investigation of the conditions under which the meeting would convene.

In 1912 the forty-fourth annual meeting was held in Pittsburgh, and only after a considerable effort was the committee able to secure the use of this magnificent building, so well adapted in all its appointments to the special use of our society. This was the second meeting under the reorganization plan, and set a record for the society. This could not have been accomplished but by effort and self-sacrifice on the part of individual members. It is only fitting that this meeting, begun under such auspicious conditions, should again be held here, where we have received such loyal support.

The Odontological Society of Western Pennsylvania is the largest component society in the State of Pennsylvania, having contributed 325 members to the State and National associations.

I beg leave to thank you, Dr. Holland, for your cordial welcome, and trust that our sojourn may be both pleasant and profitable, and worthy of your hearty greeting, and that the future meetings held in this city will be looked forward to with the memory of the pleasant gathering we have been privileged to have in this institute.

Again I thank you on behalf of this society, its members and guests.

Dr. Cameron occupied the chair while the president, Dr. FRIESELL, read his annual address, as follows:

President's Address.

By H. E. FRIESELL, B.S., D.D.S., Pittsburgh.

It is with the utmost pleasure that the dentists of western Pennsylvania welcome the State Society to our beautiful and hospitable city to hold its forty-eighth annual meeting. The officers and committees have labored earnestly to provide a program worthy of the greater responsibilities that have been laid upon dentistry in recent years, and an inspection of the list of essayists and clinics will indicate in no uncertain manner that their efforts have been highly successful.

I desire at this time to express my appreciation of the splendid work that has been done by all of the members of the various committees, and especially to thank Drs. Biddle, Barclay, Booth, and Singleton for the originality of their plans, and the unflagging zeal they have manifested in carrying them into effect.

The newspapers also have been very kind, both in the amount of space given to us and in the dignified character of the preliminary notices, for both of which we are proportionately grateful.

Our program is replete with good things for the serious practitioner who recognizes the wonderful strides that are being made in dentistry, and who not only realizes the additional responsibilities that have come to us, but is intelligent enough and progressive enough to prepare himself to meet them.

Truly, dentistry, the Cinderella of the professions, is coming into its own. With the public awakened to the importance of the care of the children's teeth, the medical profession thoroughly aroused to the dangers of oral sepsis, our legislature providing a law that makes it possible for us to have the best dental education obtainable, and numerous other influences all bearing upon the rapid evolution of dentistry, we have much to be proud of, and much to work for in the great destiny we forecast for our profession.

SUBJECTS OF MUCH IMPORTANCE TO DENTISTRY.

Looking to these ends, your committees have built up this program with the purpose of presenting as many as possible of the features that are of paramount interest. Each essayist is not only a master of his subject but a recognized leader in his field. Dr. E. C. Rosenow of the Mayo Foundation, whose marvelous investigations in pathology and bacteriology have placed him in the front rank of American scientists, will give us a paper that is of vital interest to the medical profession as well as our own.

Of the several foci of infection located in the mouth we find improperly treated root-canals to be among the most dangerous, and Dr. Elmer S. Best of Minneapolis, whose work in the treatment of pulpless teeth has attracted the attention of the dental world, will give us his latest ideas upon that subject.

Inasmuch as amalgam restorations constitute quite a large percentage of our operations, this subject is entitled to more careful consideration than is usually accorded to it. We are fortunate, therefore, in having with us at this time Dr. Walter G. Crandall of Spencer, Iowa, who, since the death of our lamented Dr. Black, probably knows more about amalgams than anyone else, and who can also *do* the things with amalgam that he knows. Those who are not acquainted with the amalgam work of Dr. Crandall will be astonished at the results that can be obtained with that material.

A few years ago Dr. William Hunter of Charing Cross Hospital, London, condemned American dentistry in a paper that was given international publicity, and made many conscientious dentists wince. But those who were familiar with the character of most of the crown and bridge work that passes as American dentistry agreed with Dr. Hunter.

The work of Hunter, Rosenow, Black, and others has shown us that crown and bridge work that cannot be done right *must not be done at all.* Dr. Albert W. Jarman of Philadelphia, one of our own members, I am very proud to say, will tell us the rights and wrongs of this important branch of our work. I have had the opportunity of referring a number of students to Dr. Jarman for postgraduate courses in crown and bridge work, and the results have been so thoroughly satisfactory that I feel that we have a right to be proud that he is a member of our own society.

Dr. S. J. Lewis of Kalamazoo, Mich., has had such excellent results in his work with plaster that we have felt it merited a place on an already full program. We also take considerable civic pride in presenting to the society the bronchoscopic work of Dr. Chevalier Jackson, a Pittsburgh physician who is recognized by the medical profession of America as being in a class by himself in this particular field.

We are perfectly satisfied to await the verdict of your judgment on the excellence of the clinics that Dr. Singleton and his committee have provided.

Addresses by preceding presidents have usually included various recommendations for the society to consider, and while it is my desire to make this address as brief as possible, I am constrained to offer a few suggestions that I feel will merit your serious thought.

NEED FOR MORE THOROUGH ORGANIZATION.

We have something over 4000 dentists in Pennsylvania; our membership is about 1100, and of this number only 729 are members of the National Dental Association. And this condition is only traceable to lack of organization. A membership or organization committee should be appointed, whose duty it would be to bring all desirable dentists into the State Society, and an amendment to the by-laws should be offered at this meeting making membership in the National Dental Association obligatory upon members of the State Society. Better organization of our profession is imperative if dentistry is to exert its proper influence in public affairs.

THE NEW DENTAL LAW.

We feel that we have a very good dental law in force at present, but some very drastic criticisms have come to our notice since a systematic effort at its enforcement has been made. It would be wise to appoint a committee on dental law that would be instructed to make a study of our present act, and with the help of good legal advice be in a position to defend the present law if it is attacked, or to propose proper amendments if it be found faulty.

DENTAL PREPAREDNESS MOVEMENT.

The movement for dental preparedness that was recently instituted at Buffalo merits our hearty support, and is recommended to your earnest consideration.

NATIONAL RELIEF FUND AND THE RESEARCH INSTITUTE OF THE NATIONAL DENTAL ASSOCIATION.

There are two other matters of national scope that are of great importance to the dental profession. One is the National Relief Fund for indigent dentists, and the other is the Research Institute of the National Dental Association. Thus far Pennsylvania has not taken a very active interest in either of these matters, probably because the members of our State Society are not familiar with the purpose and needs of these two movements, nor have they been impressed with the vast moral influence they are bound to have in establishing dentistry's right to be considered a liberal profession. It seems to your president that the members of this society could find no more fitting way to express their desire to advance the standard of dentistry in the professional world than by increasing our annual dues sufficiently to enable the Council to set aside one dollar per member to each of these worthy causes. Dr.

Weston A. Price, the president of the Research Institute, will be with us during the meeting to explain the needs of that organization; let us give him our hearty and substantial encouragement. While we are anxious to enlist the philanthropist in our free clinics, etc., let us not forget that as individuals we each have certain duties in this line to perform. No calling today is more honorable than ours; let us demonstrate as individual members of our calling that it is worthy of recognition.

I shall close my address by repeating that we are delighted to have you with us. Professor Mears, on my final examination in oral surgery, asked me a peculiar question. He wanted to know why we spelled Pittsburgh with an "h." I told him the "h" stood for hospitality. All we have is yours. May you see fit to visit us many times in the next forty-eight years.

Motion was made and carried that a committee be appointed to consider and report on the President's address.

Dr. Cameron appointed as such committee Drs. A. P. Lee, J. F. Biddle, and J. A. Standen.

The next order of business was the reading of the minutes of the previous annual meeting. The reading, on motion, was dispensed with on account of the minutes having appeared in the published Transactions.

The society then listened to reports from the various officers and committees, after which motion was made and carried that the meeting adjourn until the afternoon session at 1.30 o'clock.

TUESDAY—*Afternoon Session.*

The meeting was called to order Tuesday afternoon at 2 o'clock, by the president, Dr. Friesell.

Dr. Friesell announced as the first item on the program for the afternoon the reading of a paper by Dr. E. S. BEST, Minneapolis, Minn., entitled "Trouble *with* Pulpless Teeth and Trouble *from* Pulpless Teeth."

[This paper is printed in full at page 192 of the present issue of the COSMOS.]

DISCUSSION.

Dr. J. A. Libbey, Pittsburgh. I was glad to hear the essayist take up and describe every portion of the work as thoroughly as he did, and I hope the members of the society will give particular attention to this when it comes out in the dental journals, and will read and think over the paper carefully, because it will take a great deal of study to be able to carry out the points he has given us. I have been working along this line for many years. I remember at one time in our local society, when it was very small, that we had a paper on the subject of the treatment of pulpless teeth by one of the older members. The discussion was taken up, and it seemed to me that through kindness no one criticized the paper. Finally the chairman called on me, and I said we had heard nothing that evening but what we had been hearing for years, and that there was not a new idea in the paper; that the essayist had described the treatment for pulpless teeth, when to fill them, etc.; but the time to fill pulpless teeth was when we found them. At that time it was an astounding remark to make, but according to the study and work that the essayist has given us this afternoon, there is no necessity for prolonged treatment of pulpless teeth. I believe as many teeth have been ruined by prolonged treatment as by not thoroughly filling the canals. I have carried out the method of procedure he has described for years—that is, to first place the rubber dam, then get the field prepared and thoroughly cleaned and sterilized, and proceed as he has described; there is no better time to fill the canal than then. This is a surgical operation, and nothing is gained by treating and re-treating for some time, as by so doing we may carry into the canal more bacteria than were there when we began.

In the matter of devitalizing the pulp, as the essayist has described, it is difficult to remove all the tissue from the very apex, and in that case I would not fill the canal immediately. I would use some chemical to harden the tissue near the apex, so that I could be absolutely certain of thoroughly removing every particle of it, and those "pathfinders" he speaks of are wonderful for that purpose.

There was one point that the essayist made in which I do not agree with him, that is, using a chip-blower in the canal. You have a canal with a closed end, and it is very difficult to get anything that will force the heat up to the apex of the canal. However, there is no necessity for using the chip-blower in that way; use absorbents, and be sure that the canal is thoroughly dry.

With regard to sterilizing the apical end of the canal, when you have the canal sufficiently enlarged this can be done by one of two methods. The method I have always used is the following: With a broach in the canal, place a little creasote in the canal, and with the broach there, capillary attraction will carry the creasote up and virtually flood the apical portion of the canal; then remove the broach, and you have the apex of the canal filled with creasote. Now, by injecting chloroform and placing a gutta-percha point in the canal, you can seal to the apex any canal that you can open-up to that point. But a better way is, after you have the canal thoroughly dried, to take a fine gutta-percha point and pass it into the dried canal, then place a little chloroform on it, and the gutta-percha will carry the chloroform to the apex and seal it. The reason why a good many have irritation at the apex of the root after it has been filled is because they have tried the pumping process, and forced air ahead of the material, thereby causing pressure through the apical foramen. Now we have the canal filled, but the condition is not entirely cured. If there is any pericemental trouble after you have made a thorough operation, excising the apex of the root is the only thing to be done, because no treatment through the foramen is going to cure that condition if the pericemental tissues become diseased.

Just one point more, and that is with regard to the X-ray. I was very glad to hear the essayist tell us what could be done with the X-ray, but how many are competent to take radiographs, and how many of us can intelligently read the film after we get it? I have had a little experience in that line, and have had several experiences of mistaken diagnoses from radiographs. I recall one case particularly. The patient had a highly irritated tooth root, and was sent to have radiographs made. He then went with the films to the extractor, who removed seven teeth that were supposed to be abscessed. To my certain knowledge every tooth in that mouth was perfectly sound with the exception of one, and I had been preparing the patient to amputate the apex of that. I examined the films and could not find any abscesses. That mouth was absolutely ruined by a false reading of the radiographs. This only goes to show how careful we should be with regard to the use of the X-ray. Is every dentist going to get an X-ray apparatus, and go through this process? I do not believe that ten per cent. or five per cent. of the audience before me or of the dental profession are competent to properly read an X-ray film. That is a pretty broad statement, but I believe it is true. What, then, should we do? When we have a case we should send it to someone who we know can take a radiograph and read it, and also be able to read it ourselves. And until we become educated to that point the X-ray is one of the most dangerous things we can use. There are many other instances I could mention where more harm than good has been done because of the operator's not being able to read the radiograph properly. Dr. Cryer has mentioned a case where a physician sent a patient to him with a radiograph supposed to be showing a dark area over a bicuspid, but on taking a second radiograph, the area was found to be at the apical end of a molar root. So that it is necessary for us to proceed with caution in the use of the X-ray. I think everybody who takes radiographs should be under the control of state examiners, and should have certificates to show that they are competent to do such work.

Dr. F. D. Miller, Altoona. Dr. Best has presented a very excellent paper, and it is a great privilege to have heard it, and an honor to be one of those who are to discuss it. However, I shall not attempt to discuss the essay, but shall confine my remarks rather to emphasizing some of the important points in it.

In the first place, I should like to say that the title is most excellent, and includes in a very comprehensive manner the contents of the paper, which puts before us in a new light the troubles we are having and have had *with* and *from* pulpless teeth.

A most important feature of root-canal therapy and one which seems to be the most difficult for the practitioner to grasp is that the teeth which are causing the most harm to our patients are the ones which give no local inconvenience, such as soreness, lameness, etc. We have all repeatedly heard dentists say that because the tooth was not sore it was not causing any trouble, and I hope Dr. Best's paper will leave that one point clear in every mind.

Another important point which our essayist has brought out is that we must make a thorough and complete diagnosis in all cases, especially in referred cases and those suffering from systemic disease, and that a mouth is not thoroughly examined without the use of the X-ray and faradic test. He also emphasizes the fact that absence of pyorrhea or cavities in teeth does not mean that the mouth is in perfect condition. The field of the dentist has been extended beyond the crown of the tooth and beyond the apex through the use of the X-ray, and it is our duty to see to it that periapical infection is obliterated.

Too much emphasis cannot be laid upon asepsis, as sterility is an absolute requisite to successful root-canal treatment.

The fact that occasionally teeth with apparently well filled canals from a mechanical standpoint have diseased apices has caused some dentists to make the statement that properly filled root-canals do not prevent periapical infection, but I believe the majority of the men who criticize proper root-canal work on this account are not in possession of a great many of the facts, and are not making an honest effort to improve their technique, but are satisfied with methods that were practiced in the dark ages—I mean before the advent of the X-ray in dentistry.

At a recent society meeting I gave a clinic, and on the same program was a prominent pyorrhea specialist from New York. After the clinics were over I had several men tell me that the pyorrhea specialist had criticized the method I was advocating of filling root-canals. Later in the evening I met the gentleman, and as I am ever anxious to learn, asked him his objections to filling root-canals through the apices, and I found out that he had never had a radiograph taken, and had not filled a root-canal for eight years.

A recent editorial in the DENTAL COSMOS* makes the following comment with regard to the new dental law of New York, which goes to prove that dentistry is awakening and that in the near future we shall be *compelled* to keep abreast of the times:

> It is exactly "the unscrupulous dentist, the man who makes his goal the dollar and knows little and cares less to render service to humanity," who will ultimately be eliminated from the dental profession, and the new dental act of the State of New York is, in our judgment, an effective instrument for eradicating that type of practitioner from the State of New York. It is an effective instrument to that end for the reason that among other salutary things it makes provision for revoking the license of "any practitioner of dentistry charged under oath before the board and found guilty of unprofessional or ignorant conduct, or with gross ignorance or inefficiency in his profession, or with fraud or deceit in procuring admission to practice." Even under existing conditions—but certainly under conditions which the immediate future is sure to effectively develop—it will not be difficult to show in a given case that the operator who permits septic conditions to exist in connection with his root-canal work or his restorative operations in general will be

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* See DENTAL COSMOS for May 1916, vol. lviii, p. 567.

guilty of "gross ignorance and inefficiency in his profession," and subject, therefore, to revocation of his license under the New York State law—if, indeed, as the result of educated public opinion, he will not also be answerable for criminal malpractice.

Under modern conditions a dental operator is no more morally excusable for sealing up pathogenic bacteria in a root-canal than is a surgeon for sewing up a sponge or hemostatic forceps in an abdominal cavity.

The charts the essayist has exhibited show that he is a master of detail. His classification of the various root-canal operations and the complete technique given are extremely interesting and instructive.

The seventeen causes of periapical abscesses and the seventeen remedies are also of great importance, because neglect of any one of these may be the cause of failure.

I believe we shall all agree that the trouble we have *with* pulpless teeth is not nearly so important as the trouble the patient may have *from* pulpless teeth, and it behooves us to see to it that we give our patients scientific treatment. Someone has said "It isn't any disgrace to wear rags; the disgrace lies in continuing to wear them," and it certainly will be a disgrace for us to continue the inoculation of our patients when we know better.

In regard to sealing just to the apex of the root-canal—I mean just flush with the end of the root—I believe that this is the absolutely ideal condition, but do not think it is physically possible for one to do so unless he takes a great many more than two or three radiographs. I have been conscientious in my efforts in filling root-canals, and have a few slides that show an extreme amount of chloro-percha that has passed through the end of the root, with absolutely no post-operative soreness; while in other cases in which the fillings reach just to the end of the root, there has been quite severe post-operative soreness. I might say that I employ chloro-percha after Dr. Rhein's method.

Dr. J. J. Moffitt, Harrisburg. I agree with the essayist in a great many points, and I am not going to touch on those—Dr. Miller has done that; but I am going to speak of a few points in which we do not agree.

In the first place I believe in the careful conscientious use of arsenic at times. There are so many times when we cannot use pressure anesthesia, conductive anesthesia, or nitrous oxid, on account of the condition of the patient, that it is very well to know how to use arsenic. The bad results from arsenic come from putting it in under pressure, causing it to pass through the apex, but when put in with a metal cap and sufficient care it will not go through the apex. The tissues are different on the outside from the inside and arrest the action if there is no actual contact of the arsenic.

It is not necessary to use rubber dam in every case of root treatment; an aseptic technique can be accomplished without it. It is well to know how to manipulate it, but in very many operations we cannot use it, and in those cases it is necessary to know how to get along without it and not infect the root-canal.

With regard to having a definite technique, everyone should have a system he can employ aseptically. As to infecting the root, it is not so easy as one may think. The bacteriologist who is going to make a culture for diphtheria or for any disease of the throat or mouth knows that if the patient has washed the mouth with dioxid or listerine or any of the well-known antiseptic solutions, there is no use in making a culture for half an hour, because he may not get a growth, and the employment of suitable antiseptics is just as effective during a root operation. We want a technique in root-canal work that is simple to use and sure in results, and if we can get these two things together, it would be the ideal method. I think Dr. Best has shown careful technique and investigation, but I do not think I would care to attempt to go through all that detail in order to secure success. I do not believe any man can hermetically seal a root. I think the ones that are successfully sealed are sealed by natural tissue growing over the apex. Not long ago I put a tooth through a course of tests I have for determining whether we must use a simple filling, treat the tooth for abscessed conditions and infection in the root, curet the tissues around the apex, resect the root, or extract the tooth. There is a definite system of procedure that one can go through, with the aid of the radiograph, to determine these things. I put the tooth through that test, and came to the conclusion that the end of the root should be resected. When I removed the apex I found there was a slight curve in the root, that there had been a puncture through the root, and the real canal had deflected a little to the left and had never been cleaned out. This unfilled portion of the root would always be a source of irritation and could never be filled properly, and that proved that the conclusion was right in that case that the apex must be amputated. In another similar case, after going through this process and determining that the root should be resected in an upper second bicuspid I proceeded to resect the root, and when I removed the end of the root I found that it had five foramina. That is a very unusual condition, and I do not think anyone could have filled that apex, but if there had been a system of treatment to induce the tissue to grow over these apices before infection occurred, it would have been unnecessary to fill them. I do not think it is necessary always to fill roots to the ends. I think a great many troubles are caused by the attempt to do so, thus preventing natural encapsulation of the root, which I believe a successful result in root-canal filling depends on.

It does not do any good to take a picture of a tooth root immediately after filling to see whether or not you have reached the apex. Rather, look at the tissues outside to see whether the membrane has begun to swell outside of the root, or the bone has become affected in the course of three or six months. Seeing the condition of the filling does not do any good, because if you wished to find whether or not you had sealed the root-end against germs, you would have to magnify the picture sufficiently to see the germs, and under such conditions the cracks about the root-filling would be many times larger than the germs. What we want to do is to get the apex sealed over with natural encapsulation, which is the case, I believe, in every successful root-filling we have, especially in anterior roots of the lower molars that seldom are filled to the apex. The absence of pain after filling the root-end is one guide as to our success, and then when we make a radiograph and examine the tissue outside the apex after several months or longer, and find it is normal, and the physical examination is satisfactory, there is no reason to disturb the tooth, because the root is encapsulated. And that is the condition that exists in many old-fashioned root-fillings with cotton and creasote. The creasote did not go through the end of the root and did not form an eschar to prevent the encapsulation, but kept the inside of the root in a safe condition; no germs could grow, and the tissue grew across the end of the root. If nothing ever happened afterward to break up the encapsulation, that filling would remain as long as the patient should live, simply because of the encapsulation. I believe that is the thing we should work for, and we should adopt a technique that would accomplish that result.

I do not believe that the blind abscess is so serious as it has been made out to be of late. It has gotten to be quite a matter of argument in many dental societies as to the amount of damage that a blind abscess can do by its presence in the system. In the case of diphtheria, the membranes absorb the poisons, but the germs do not spread through the system. So why will germs under the gums or in fistulous abscesses not be absorbed more by the gums or vessels near the abscess or in pyorrhea pockets in the soft gum tissue—why would these not be absorbed more readily than those in an encapsulated small blind abscess? It is a matter of the resistance of the system that accomplishes the encapsulation of the infection, making it a blind abscess. Poisons absorbed in a system that cannot resist the proliferation of germs must be more harmful than in a system where they can be resisted, therefore I think we are laying a great deal of stress on the dangers from blind abscesses, and advocating extraction unnecessarily, simply because they are liable to lead to serious conditions. There are means for determining whether a blind abscess can be cured or not, ways which we should learn.

There are five errors in filling a tooth that may cause interference with the encapsulation of the apex: (1) The use of infected instruments forcing septic material through the end of the root; (2) forcing too strong drugs through the apex; (3) pressure from gases generated or air confined under treatment fillings; (4) too long a root-filling, and (5) too short a root-filling. There are two general classes of cases that determine the different treatment of the teeth in root-canal treatment, first non-infected roots, second infected roots. The only drugs necessary to be used in the first class are probably dioxid where there has been bleeding—and that only in cases where there is no danger of going through the apex—and liquor antisepticus. Strong antiseptics should not be used in root-canals that are not infected, because the dangers from the drugs are worse than the chances of infection. Anyone who knows anything about the technique of bacteriology knows that it is easy to destroy the germs in root-canals. In the case of an infected root, beechwood creasote is the best drug to use. It should be used dry, so that it cannot be forced through the end of the root, and never under any circumstances should a filling be put on it that will cause pressure, because if the creasote is forced through the apex you will not get a satisfactory result except by mere luck. You can wash out the excess of the creasote with alcohol after using that treatment, then, applying a dressing—which may be liquor antisepticus on cotton—you find that the flow of pus soon stops, and then encapsulation has begun. It does not necessarily follow that an abscess area in the bone is filled-in right away, but it will fill-in in the course of six months or a year. I have made enough examinations of teeth with the X-ray to prove that.

In the case of infected roots, remove the infected tissue and enlarge the root-canal; that is one of the most important procedures, knowing how to enlarge the canal while keeping in its center. I do not know of any one set of instruments devised that will suit every operator. I think each man has to select his own instruments. I have found that to be so with my assistants, who often do good work with different instruments from those which I use. Wash out the root with dioxid if necessary, and use liquor antisepticus on cotton—and that cotton will never have to be sterilized before using if it has liquor antisepticus on it. The necessity for enlarging the canal is due to the fact that the septic matter has probably penetrated the tubules to some distance from the center of the canal, and it is best to get that material out at once if you can. After you have placed your test dressing in the canal, place gutta-percha over it without causing any pressure. If pressure is applied some of the material may go through the end of the root and defeat the object you are after—natural encapsulation. As soon as the dressing is placed in the canal, take a bristle and pass it through the gutta-percha in order to allow any air that may be there to escape.

Any material that cannot be gotten out of root-canals without risk must be left in, and if it is not infected it makes a better filling than can be put in, if growth of healthy tissue across the end of the foramen can be induced.

Generally speaking, the time for extracting a tooth is when that tooth is hopelessly loose. If it is tight you usually can cure any abscess. If a properly made filling is insufficient, the next step is the curetting of the apical area. If this fails, then remove the apex. When the apex is inaccessible in molars, remove the bad root only. If this fails to cure, having maintained proper drainage, autogenous vaccines should then be tried, after which, if the growth of new tissue cannot be promoted, the only thing left is to extract the tooth.

Dr. J. F. Biddle, Pittsburgh. I had an opportunity to read Dr. Best's paper before coming to this meeting, and seldom has it been my privilege to examine a neater or more carefully arranged manuscript. I could not help but feel that a man capable of preparing such a paper would undoubtedly be one to place cleanliness, sterilization, and thoroughness before all else in conducting his operations.

Dr. Best has asked, Where in the scale of responsibility to life do we dentists come in? Although it is only recently that we have become aware of our tremendous responsibility, and although many of our patients may be ignorant of it, nevertheless we are near the head of the scale, our knowledge and skill in many cases being as essential to the health and life of the patient as is that of a skilled surgeon. A few weeks ago I was called into a hospital to make a dental examination of a patient. She had been admitted to the institution to be treated for typhoid fever, which diagnosis of her case proved incorrect. She also had symptoms of pneumonia, but the disease did not develop within a week. Several specialists were called in. One of these suggested that her mouth be examined, which was accordingly done, and it was found that there were many pyorrhea pockets, loose teeth, and two bridges with abscessed teeth in the mouth. Her physical condition was very discouraging, but as a last resort it was decided to remove the bridge work and extract the loose and abscessed teeth. This was accordingly done, but unfortunately too late to save the life of the patient.

This is an extreme case, but one likely to happen in any man's practice, even though he exercise extreme care in diagnosis. Formerly, many of us believed that if we refrained from the use of general anesthetics and cocain we need not worry about the effect of our work upon the patient's health, while the possibility of the loss of the patient's life was not even considered. But, gentlemen, in view of many of our recent discoveries regarding the teeth as a prime factor in many constitutional disorders, it is our duty as a profession to change many of our methods if it be our desire to avoid criticism, retain our practices, and preserve our prestige as a profession.

Under conditions noted as trouble *with* pulpless teeth I shall consider two:

(1) The difficulties encountered in opening canals and removing pulp tissue, where the operation is carried through to completion, and the operator is not deterred by the first obstruction with which he comes in contact—calling it the end of the root. This difficulty has caused many failures which may be attributable to laziness on the part of the operator, lack of time, or perchance to inadequate means of diagnosis. Only recently I extirpated the pulp of a lower canine having a much longer canal than is ordinarily found—in fact, the longest root I have ever seen on a lower canine. After the apparent removal of all the pulp, I measured the root and filled it in the usual way, after which the tooth was radiographed and it was found that the filling extended only to within a quarter-inch of the apex. The root-filling was then removed and it was discovered that the apical portion of the pulp had not been removed. When this was accomplished, the canal was enlarged with sulfuric acid and reamers, and a perfect root-filling inserted. In removing the pulp tissue from curved roots, one must avoid making pockets with reamers and drills, for after so doing it is impossible to get past many of them.

(2) Teeth becoming sore after operations: Teeth of this character require a most careful and painstaking diagnosis, that one may differentiate intelligently between temporary soreness following a successful operation, or as the result of the presence of septic material and a poor operation.

In the consideration of trouble from pulpless teeth, our essayist has adequately enumerated the various steps, and in view of our knowledge gained from recent discoveries of well-known investigators, one can be reasonably sure that if he be thorough in his treatment of pulpless teeth he will have very little trouble from pulpless teeth with their sequelæ.

In root-canal operations the first requisite is a thorough knowledge of the number, size, and location of canals in normal teeth. Of course there may be some variation, but if the working basis be thoroughly mastered, one should be enabled to locate the canals in the great majority of multi-rooted teeth after the roof of the pulp chamber has been removed. The thorough removal of the roof of the pulp chamber should be accomplished even though it be necessary to weaken the crown of a tooth to do so, for a house can be no stronger than its foundation.

I have been greatly interested in the technique employed by our essayist, but if I enter into a discussion of it, I fear I shall curtail the time of the gentlemen to follow me, hence I shall refrain. May I in closing emphasize my appreciation of Dr. Best's paper and his thorough and painstaking presentation of his subject? What we need in dentistry is more conservative men of Dr. Best's caliber, men who will develop this field by accurate and scientific methods, rather than by the hurrah and great claims of some self-styled educators that every tooth root, no matter how difficult, can be successfully treated, to the mutual satisfaction of patient, operator, and radiographer.

Dr. Best (closing the discussion). I shall not attempt to answer all of the questions that have been raised, because the hour is too late. One point raised regarded the very unusual condition where we find four or five foramina at the end of the root—I believe that was Dr. Moffitt's suggestion. That is not to my knowledge an unusual condition; it is a very common one. The unusual condition is where we find only one foramen, and that is why I believe that in filling root-canals and attempting to seal these foramina we should introduce something in the shape or form of liquid which will seal the apex. I do not go so far as some men doing root-canal work who are advocating that the filling should go through the apex in a mass, because as I said before, it is not the case of one opening, but several. However, it should not alarm us if the filling does go through a little. With me it has not been the case of having the courage to stop at what I imagined was the end of the root; my trouble is in not having the courage to keep on until I get there. It is not so difficult to know when to stop as to have the courage to keep on until you get there.

With regard to the use of the radiograph in making a picture of the root-canal filling after completion, I think Dr. Moffitt misconstrued my meaning in that. I did not have reference to the preservation or non-preservation of the periapical tissue immediately upon completion of the filling, but I *did* have reference to seeing whether or not we had succeeded in placing the filling material in the apical portion of the root, or whether we had reached only half the length of the root and then stopped. This condition does not apply to molars and bicuspids only, but to the upper anterior teeth as well, and in fact to all single-rooted teeth. There is just as large a percentage from our examinations of centrals, laterals, and canines unfilled as from molars and bicuspids.

One point comes to my mind that I want to call attention to, and that is, we have been led to believe that these fine canals, which are so fine that it is impossible for us to open them, are not likely to give trouble. In a series of experiments in this connection we selected the buccal roots of upper molars, the mesial roots of lower molars, upper first bicuspids, and the lower anteriors, and in examining 145 of these cases we found that 80 per cent. of them showed diseased conditions surrounding the roots. I mention this to show that one must get thoroughly into these canals, because they are as dangerous as the large ones.

Regarding the use of arsenic, and the relation of the effect between arsenic and sulfuric acid on the periapical tissue, we do not seal sulfuric acid in the root and leave it there, but we do seal-in arsenic;

we do not immediately apply something which counteracts the effect of the arsenic, but we do apply something to counteract the effect of sulfuric acid, and that is bicarbonate of soda.

In closing, I want to thank you for your most courteous attention while I have presented this subject. From your interest it is plain to see that you think, as do I, that this is a problem that concerns every member of our profession. It is probably the biggest question we have to handle, and beyond a doubt upon its solution depends success or failure for us all.

The next business on the program was the Report of the Committee on Oral Hygiene and Public Dental Education, Dr. S. B. LUCKIE, West Chester, chairman, as follows:

Report of Committee on Oral Hygiene and Public Dental Education.

During the year the work of the Committee on Oral Hygiene and Public Dental Education has been chiefly that of preparedness.

It now has in its possession a set of lantern slides, thirty-six in number, and the manuscript of a lecture on the subject of "The Care and Uses of the Human Mouth," prepared by the National Mouth Hygiene Association. The manuscript deals with the mouth as the most important part of the human machine in the maintenance of health. Each slide is fully described, so that anyone can talk to an audience composed of pupils from the fourth grade in our public schools or to an audience composed of adults, with little expenditure of time or thought in preparation.

These slides and manuscript are neatly packed in a box, and can be expressed to any point with small risk. The object of purchasing these slides was to further public dental education throughout the state by renting them to members of the Pennsylvania State Dental Society, the revenue returned to be used in continuing the propaganda of public dental education by such means as may seem proper.

Reports of component societies of the work done in their respective districts are as follows:

REPORTS FROM VARIOUS SOCIETIES.

The Reading Dental Society reports: We made our sixth annual inspection of the mouths of all the children of the first grade, both in the public and parochial schools, about two thousand in number. As heretofore, we submitted a copy of the examination to the parents or guardians of the children. The work, as previously, was done gratuitously by the members of the Reading Dental Society. There is a movement on foot and a possibility that the work may be done by a paid inspector next year, to be paid by the public school authorities.

Our free dental dispensary, which we operated for six years gratuitously, was turned over to the Reading school district, and is now being operated by a paid practitioner. With the aid of several citizens we procured a Forsyth unit, and in addition to the former outfit, we presented to them a complete equipment.

We have since opened two dental dispensaries, one at the St. Catherine Orphans' Home, and one at the Children's Home, both being operated by paid operators. The funds were secured from a few philanthropic citizens. The three dispensaries are under the supervision of an advisory board, selected from the membership of the Reading Dental Society.

For the Lehigh Valley Dental Society, Dr. H. W. Bohn of Bethlehem reports as follows: Owing to the large territory covered by this society the oral hygiene work has been given over to the members living in the different towns and cities.

In Bethlehem we have succeeded in inducing the school board to engage a dental nurse, a graduate of Dr. Fones' school, who has been engaged in examining the teeth of the children. In bad cases she visits the parents and explains the necessity of a visit to the dentist. Where the parents are unable to pay for the work the local dentists agree to do the work in their offices without charge. For the smaller cities and towns we consider this plan better than having a central clinic.

We also gave free exhibitions of the famous toothache film in one of our moving-picture houses to all the children in the town. During "baby week" one of our members gave an illustrated talk on "The Care of the Teeth."

Dr. C. J. DeLong of Allentown reports for Allentown: "We have had the Allentown public school free dental clinic opened two half-days a week during the school year; the school board furnished the supplies for the year. Eighteen dentists gave their time free. The school board has appropriated eight hundred dollars to employ a dentist to give four half-days each week for the coming school year.

Work done.

Number of teeth filled	630
Treated and filled	169
Cleaned	60
Deciduous teeth extracted	129

Dr. W. B. Mausteller reports for the Harrisburg Dental Society: "A year or two ago the school authorities established a dental clinic independent of the dental society. They have two dentists employed a part of their time, and have a dispensary. I am not familiar with their work in detail, but they seem to be doing generally good work."

The Eastern Dental Society of Philadelphia has done no work, but expects to take the question up in the fall.

The York Odontological Society reports progress: "The Committee on Oral Hygiene appointed to meet the board of school control submitted our proposition to that board, and it is now in their hands. Up to the present we have received no report from them."

The Chester and Delaware County Dental Society has two committees, one for each county. The Chester County Committee has no report to make. The Delaware County committee reports the following talks: Dr. A. Kassab, October 18th, to the boy scouts; Dr. S. B. Luckie, November 18th, to the public school teachers; Dr. A. Kassab, November 30th, to the parents' and teachers' association at Woodlyn; Dr. S. B. Luckie, April 11th, to the Y. W. C. A., and also to the general body of nurses at the Chester Hospital, February 18th. Clinics continue for children under fourteen years of age at the Chester Hospital every Thursday from 4 to 6 P.M., and a course of lectures on oral hygiene is given to the nurses of the graduating class.

The following societies have no committee on oral hygiene: Central Pennsylvania Dental Society, Schuylkill County Dental Society, Odontographic Society of West Philadelphia, Odontological Society of Western Pennsylvania. The other societies have made no report.

The manuscript and slides alluded to in this report were not obtained until the month of March, which time seemed too late in the school term for them to be used in the public schools. The chairman, however, notified the secretary of each component society of the purchase, stating the terms of rental. (Here the slides were shown.)

Financial report. Received of Dr. W. A. Spencer, treasurer, $50.00—*i.e.* December 29th, $25.00; and March 27th, $25.00. The sum of $45.60 was spent for stationery, stamps, and slides—leaving a balance of $4.40.

H. M. Beck, Wilkes-Barre.
H. W. Bohn, Reading,
W. B. Mausteller, Harrisburg.
T. W. McFadden, Wilkinsburg.
S. B. Luckie, *Chairman*, Chester.

The society then adjourned until the evening session.

(To be continued.)

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

EDWARD C. KIRK, D.D.S., Sc.D., LL.D.

PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, FEBRUARY 1917.

EDITORIAL DEPARTMENT

"American Dentistry."

WE take particular pleasure in directing the attention of our readers to the admirable article by Dr. N. S. Jenkins in this issue on "The Influence of American Dentists upon Europe."

Apart from its intrinsic interest as a literary narrative, Dr. Jenkins' article is an important historic document because it is the recorded observation of one who was himself one of the makers of the high reputation of American dentistry in Europe, and who for a full half century upheld the ideals of the pioneers who had preceded him in European capitals. What those ideals were, Dr. Jenkins' paper clearly indicates, and the recognition which these standard-bearers of American dentistry received in the highest court circles of Europe is an outstanding historic fact of which the dental profession universally has every reason to feel proud. It is therefore a source of peculiar satisfaction that we are permitted to present to the readers of the DENTAL COSMOS this authentic record of the achievements of the pioneer group of representative American dental practitioners in Europe, by the surviving member of that distinguished body. Such a record is genuine history by one of its makers.

Dr. Thomas W. Evans went to Paris in 1844, the year that Horace Wells discovered the anesthetic properties of nitrous oxid and so gave to the world the boon of surgical anesthesia. This was but five years after the founding of the first dental educational institution, the organization of the first national dental association, and the publication of the first dental periodical. Dentistry as a profession was still in its swaddling-clothes when the men of whom Dr. Jenkins writes were building the reputation of American dentistry in Europe upon secure foundations and winning for it an enviable social and professional status. Since the time of these pioneers practically the whole evolution of dentistry as a profession has occurred, the changes that have since taken place being in many respects revolutionary.

The successful achievement of the pioneer group of American dentists in Europe attracted general attention, and stimulated the ambitions and efforts not only of those who were genuinely and legitimately desirous of promoting by educational and ethical means the best achievements of professional dentistry, but the material success of those who had made a name for American dentistry in Europe stimulated the cupidity of a flock of charlatans who seized upon the phrase ''American dentistry'' as a term wherewith to conjure from the uninformed public large fees in return for their malpractice. The unprincipled quack, the blatant advertiser, sounded this slogan until the term became a stench in the nostrils of the legitimate dental profession of Europe and a reproach to the dental profession of America.

That which gave to American dental practice its distinctive character in the eyes of the general public was the rapid development of technique in connection with its operative procedures, and the coincident manifestation of inventive resourcefulness in the creation of the many devices of distinctly American origin necessitated by and dependent upon the evolution of dental technical procedures. As a result the American dentist early attained a leading reputation for manipulative skill and for fertility of inventive resource—the effect of which was to stimulate similar activities among dental practitioners in many of the great social centers of Europe, with the further result that many native practitioners of a high order of merit were produced and won for themselves positions and reputations of commanding importance.

The early stages of dental evolution, especially from the American point of view, were characterized by its development as an art. From the beginning of its history in Europe the profession there gave increasing attention to the study of the underlying scientific principles of dentistry. Hence we find in the dental literature of Europe proportionately more space and attention devoted to dental science than to dental art and manipulation, while the reverse is true of American dental literature of the time under consideration. All of which was not infrequently crystallized in the assertion that while America leads in dental art, Europe leads in dental science. But in the progress of time these two viewpoints, like opposing forces, have tended to establish an equilibrium. The educational systems of Europe in dentistry have taken advantage of and profited by the development of dental art in America, and similarly America has realized the fundamental importance of a broad training in the scientific basis of dentistry as a *sine qua non* for efficient and skilful dental practice. As Dr. Jenkins has clearly pointed out, the distinctions between American dentistry and European dentistry are disappearing—if indeed, in their best expressions, they have not already disappeared. What was once called American dentistry is becoming, if it has not indeed long since become, traditional rather than an actuality.

With the broadening outlook of the larger vision which the civilizing influence of closer international relationships is inevitably creating, it is well for us now to look forward to the time for which our anxious and distressed humanity is expectantly and hopefully waiting, that will eliminate the insanity of war and leave the world to the cultivation and contemplation of the pursuits of peace. When that consummation has been achieved, should it not be the first duty of someone to inaugurate a movement that will bring together the representatives of "the world's dentistry" in an international dental congress that will do two things—First, that will demonstrate to all that dentistry belongs to no country in particular, but to the world; that geographic limitations with respect to dentistry, as to any other department of biologic science, are provincial and therefore have no place in science. Second, to demonstrate that the ties of professional brotherhood are stronger, and therefore paramount to the differences arising out of political antagonisms;—and so by the cultivation of fraternalism do our part in nullifying the bitterness in the hearts which have been made sore by the horrors of national conflict.

Where better could this be done, by whom can it be better done than by those who are representative of and have inherited the high ideals of those who in the early days made real the good name of American dentistry?

REVIEW OF CURRENT DENTAL LITERATURE

[*Journal of Infectious Diseases*, Chicago, October 1916.]

The Specificity of Streptococci. By A. T. Henrici.

Henrici prefaces his report with a brief but comprehensive review of past work, and throughout his essay abundant references to and comparison with the literature is made. The purpose of his study "has been to demonstrate by experimental means what relationship, if any, exists between the various biochemical characters of the streptococci (hemolytic power and carbohydrate fermentation reactions) on the one hand, and virulence, elective organ affinities, and the character of the exudate produced, on the other." To answer this problem 53 strains of streptococci were inoculated into 225 rabbits, from which evidence Henrici concludes that "The carbohydrate fermentation tests are of no significance from the standpoint of virulence, and of slight or doubtful significance from the standpoint of tissue localization," while the hemolytic streptococci are more virulent than the non-hemolytic, but these two classes localize in the same tissue with equal frequency.

The sources of material and the methods of study are carefully detailed which would simplify and standardize subsequent investigations by others. The sources of his streptococcal strains, other than those taken from oral conditions, were nose (2), sputum, tonsil (4), blood cultures (2), empyema, post-pneumonic arthritis, ascitic fluid, meningitis, feces, cervical lymph node, and two cultures (one scarlet fever) from the throat.

The lesions produced may be divided into 2 groups—(1) hemorrhagic (interstitial), and (2) infiltrative. No attention was paid to the parenchymatous changes. Henrici enlarges on the special lesions (and reproduces photomicrographs) in seven structures—heart muscle, heart valves, joints, voluntary muscles, lymph nodes, spleen, and kidneys. Every one of his 53 strains was tested on several (usually four) rabbits. While occasionally a given strain failed to produce lesions on one rabbit, only 3 strains—and none from oral sources—failed to produce any lesion on some one or more of the rabbits into which it had been injected.

Henrici's study is primarily a contribution to general pathology. It is, however, of peculiar interest to the dentist to know the behavior of streptococcal strains isolated from dental lesions (or saliva) in comparison with the behavior of strains isolated elsewhere, and such a comparison Henrici does not make. An analysis of his statistics, however, reveals the following relations. The terminology of the strains is that of Andrew and Horder: In the case of S. pyogenes (group 1), S. mitis, and S. fecalis, the strains which had been isolated from oral sources showed a far higher average of total number of lesions than did those arising from other sources. In the case of S. salivarius, those strains of other than oral origin showed the higher average of total number of lesions. In the cases of S. pyogenes (group 2) and S. anginosus, no strains came from oral sources, so that no comparison is possible.

It will be remembered that Henrici noted lesions in 7 different structures. The average number of different structures affected by strains of oral origin was slightly higher than the average by strains of other origin, although the maximum of lesions for the oral strains was 5, while the maximum for other strains amounted to the full 7 different structures.

These comparisons do not necessarily indicate that the virulence of oral strains is higher than that of a given strain from any other source: but they do indicate that the oral strains are at least above the average virulence of strains isolated from the abovementioned other sources.

A Contribution to the Study of Lingual Ranula.

By R. T. Aguirre, Guatemala, Central America. [Pamphlet.]

The treatises on pathology describe as the sole affection of the glands of Blandin-Nuhn, congenital or acquired cysts—called ranulæ or lingual ranulæ. Aguirre aligns himself with Dubois and those others who believe that lingual ranula has its origin only in the glands of Blandin-Nuhn. He believes that the case he details very clearly shows that a ranula developed in the very position occupied by the left gland of Blandin-Nuhn, and that the cyst presented no prolongation or diverticulum which would connect it with the sublingual region, and thereby make it a branch of a sublingual ranula.

Lingual cysts are rare; those developed on the glands of Blandin-Nuhn are still rarer. Medical literature is very poor in this respect. The case Aguirre describes had been developing during thirteen years, and had reached monumental proportions. In this respect it presented very valuable features favorable for the correct interpretation of similar abnormalities.

Case. Female, age thirteen, indigenous to San Martin Cuchumatan. Hereditary antecedents had nothing pertinent. Personal antecedents had nothing pertinent. History: From birth there had been a small tumor on the lower surface of the point of the tongue; very gradual growth continued up to the time of presenting to Aguirre, producing the complex of symptoms soon to be described.

Examination: There was found a great hypertrophy of the tongue, localized to the anterior two-thirds of the buccal part of the tongue. Posterior third completely normal. More minute examination revealed resistant, slightly fluctuating, translucent ovoid tumor, 6 cm. long, 4½ cm. wide, 3½ cm. high.

The upper surface of the tongue over the tumor was eroded and desquamated; ulcerated. Aspiratory puncture of tumor yielded some drops of thick, viscid, whitish, odorless fluid—*i.e.* a mucous fluid. The weight and size of the tumor had displaced all the anterior inferior oral structures in making a bed for itself.

Functional disturbances: Prehension of food, mastication, deglutition, speech, salivary secretion, and respiration were all interfered with, and changes were experienced in the mobility and sensitivity of the tongue. In attempting to define the limits of the cyst, its posterior wall was ruptured. This gave rise to an acute glossitis. Operatory intervention clearly demonstrated the existence of a lingual ranula, developed at the expense of the left gland of Blandin-Nuhn.

Operation: Under local anesthesia (cocain) a bistoury was introduced into the point of the tongue, and the walls of the cyst cut. Then upon moderate pressure, 80 cc. of a thick, viscid fluid, weighing 150 grams, was evacuated. The cystic cavity was packed with iodoform gauze and precautions taken to keep the mouth and field of operation specially clean.

Post-operative treatment: In 24 hours the tongue had much diminished in volume. Inflammation was almost gone. Patient had slept well. No pain. Lavage of wound with boric acid. Whole interior of cyst strongly cauterized with $AgNO_3$. Packed with plain gauze.

In 48 hours: Repetition of above.

In 72 hours: Entire cystic wall extirpated. Cavity painted with tincture of iodin. Packed with iodoform gauze.

In 96 hours: Granulations in cavity of wound, etc.—to uneventful healing.

A second operation was resorted to to restore the tongue to more normal proportions. In spite of success in this, the functional disturbances did not relatively ameliorate, because of the irregularity of the dental arches.

CONCLUSIONS.

Lingual ranula develops at the expense of the glands of Blandin-Nuhn. This observation does not pretend to deny that sublingual ranula sometimes can appear as a prolongation into the interior of the tongue and form a lingual ranula, and does not disprove the existence of mucoid cysts at the point of the tongue, dependent upon the embryonic remnants of the thyro-glossal ligament. The histological examination of the tumor reveals it to be a mucoid cyst.

Ranula is a disease borne patiently and allowed to develop typically only among primitive people.

Lingual ranula is a benign tumor of slow evolution, whose natural conclusion would be self-cure, if serious complications did not intervene.

In the presence of observations of Dubois and of Blandin and of Aguirre, we have the following indications of lingual ranula:

(*a*) Lingual ranula is easily cured by simple aspiratory puncture, followed or not by iodin injection.

(*b*) Lingual ranula when it reaches medium dimensions can be cured in the same manner as that employed for sublingual ranula, viz, cutting the anterior wall of the cyst, cauterizing the interior with $AgNO_3$, and packing cavity.

(*c*) When lingual ranula reaches dimensions such as in the above case, the walls of the cyst must be extirpated, or cauterized, and then the cavity closed by means of suturing the lips of the wound.

The present instance of this lingual affection—by its long period of evolution and its excessive size, by the complicating glossitis, by the luxation of the temporo-mandibular articulation which it produced, and above all by demonstrating anatomically its position in one of the glands of Blandin—is believed by Aguirre to be the farthest-developed ranula, the richest in complications, of all cases so far observed.

[*Tijdschrift voor Tandheelkunde,* Utrecht, Jan., March, Aug., and Sept. 1916.]

The Morphological Varieties of the Human Molars (*a propos* of Bolk's Theories).

By J. A. W. Van Loon.

The orthodontist, more than any other class of dental practitioners, finds interest in the phylogeny of the teeth. The biological history of the individual cusps appeals to his peculiar interest in the occlusal inclined planes of the teeth. The alteration in tooth form, the suppression of this or that tooth, the modification of the dental arches, throughout the evolution of the vertebrates to man, strike responsive chords in him who is constantly meeting vagaries in occlusion.

The most recent comprehensive phylogenetic study of the human (primate) teeth has been a series of works by Bolk. These have been reported from time to time in the Dental Cosmos. Their concepts and conclusions are very novel. The literature has been looked through with some keenness to find expressions of opinion, confirmatory or otherwise. Except for a few polemical denials by Adloff, nothing appeared until Van Loon began (January 1916) the publication of five extensive articles. Van Loon is an orthodontist, so it is quite fitting that he should be the one first to express a broad critique of Bolk's theories.

Van Loon in these studies utilized only the data of comparative anatomy, principally from human material, somewhat from the other recent primates. The collections at his disposal were (1) living patients in the dental institute, Utrecht; (2) a fine odontological museum owned by J. E. Grevers, and (3) that belonging to the institute. In the first part of his work Van Loon restates carefully and exactly Bolk's dimeric theory, and shows that, according to his opinion, it is unsatisfactory. He then proceeds to develop his own views upon the morphogenesis of the human dentition.

In his first paper he reports an extensive study, centering about Bolk's premolar root. In the second paper he begins with a consideration of the homologies of the cusp topography among the primates. In the third paper the comparative morphology of the crown of the human mouth is introduced by a consideration of the human premolars. As the most acceptable explanation of the variations of this tooth, Van Loon suggests that we look upon it as composed originally of four triconodont odontomeres. If this were so, the line of most recent fusion would lie from the middle of the buccal side to the middle of the lingual side. This, if we apply Van Loon's criteria, would determine the most frequent location for the occurrence of an atypical sulcus. Nowhere does he report such a condition; its absence militates strongly against his conception.

In the fourth paper of the series, we find sixteen different types of upper human molars described in detail. In this study particular attention was given (1) to the pattern of the ridge system, (2) to the number and form of the principal (protocones) and accessory cusps, and (3) to the topographic relations of the cusps to the roots.

As the result of his studies, the following are Van Loon's conclusions, or those of more general interest, deduced from the study of upper human molars:

The human upper molars consist of four triconodont odontomeres, which are fused both transversely and sagittally. This coalescence can occur with a wide variation in the relative positions of the odontomeres to one another. The mesio-lingual cusp of the four-cusped molars in man consists of two cusps—the coalesced protocones of both deuteromeres. The topography of the cusps to the roots is the surest sign by which to recognize the identity of a cusp. Each odontomere has potentially two roots, so the number of roots of the upper molar might rise to eight.

In the fifth paper, Van Loon describes in detail seventeen types of lower molars. In essence this study tends only to confirm the conclusions drawn from the upper molar. He concludes with the apparent wish, for the sake of consistency with his conclusions regarding the premolars, to make each molar a complex of eight, originally distinct, triconodont odontomeres. He promises to report later upon the varieties in the human incisors, canines, and premolars.

The study of Van Loon's report leaves one with the conviction that he has not appreciated the danger of the atavistic interpretation of the minutiæ of dental morphology. He seems driven by the fixed idea that he must attach phylogenetic import to every irregularity and difference, no matter how slight, in coronal and radicular structure.

However, the extent and intensity of Van Loon's work and its relation to Bolk's theories make it a worthy contribution to odontological literature. After we have discounted his interpretations, we shall find the greatest value of these articles to lie in the fact that they constitute a large record of the varieties of the human molars.

[*Journal of the American Medical Association*, December 2, 1916.]

Experimental Endocarditis: Its Production with Streptococcus Viridans of Low Virulence. By H. K. Detweiler and W. L. Robinson.

To understand this work it is perhaps well to begin with the authors' conclusions: "(1) S. viridans, isolated from the blood in cases of chronic infectious endocarditis, is of very low virulence, probably lower than any hitherto reported as being recovered from a similar source; (2) these streptococci are capable of producing lesions in animals (rabbits) identical with those found in patients from whose blood the organisms were obtained; (3) the strains of S. viridans isolated from the mouths of normal individuals are similar to those isolated from the blood of patients suffering from chronic infectious endocarditis, and are equally capable of producing heart lesions in the rabbit."

From the foregoing it will be seen that there are two parts to the work under consideration: (1) The isolation and identification of S. viridans—15 strains—from the blood of patients suffering from chronic infectious endocarditis, the determination of the virulence of the organisms toward rabbits, and the study of the cardiac lesions produced by the injection of these organisms into rabbits; and (2) the isolation of 11 strains of S. viridans from the teeth, gums, and tonsils of medical students, and a study of the lesions produced in rabbits by these organisms.

Dental interest will center in the second part of this work. It gives heart lesions as present in 80.6 per cent. of 31 rabbits, 67.7 per cent. showed myocarditis, 32 per cent. aortitis, and 22.5 per cent. pericarditis, while arthritis was noted in 12.5 per cent.

None of the strains isolated from the blood in cases of endocarditis produced joint lesion, whereas definite arthritis was present in four cases from strains from mouth and tonsils. The authors interpret this as showing that S. viridans in some cases manifests a dual affinity (for heart or joints, or for both).

" . . . . The percentage of positive results in connection with the mouth and throat series is greater than that of the series recovered from the blood." The authors would explain this difference on the basis that the organisms of the latter series lost some of their virulence from having been carried on artificial media longer than the organisms of the former series. But this quotation, apart from all modifications, becomes of a possibly absolute significance when considered in connection with the concluding paragraphs of the above review of Henrici's work.

[*Journal of Infectious Diseases*, Chicago, September 1916.]

Leptothrix Innominata (Miller). By W. B. Wherry and W. W. Oliver.

This is a brief announcement of the isolation and artificial cultivation of this organism from the "materia alba" along the human gingival margin. It can be isolated on Martin's medium (*Jl. Pathol. and Bacteriol.*, 1911, No. 15, p. 76) with reactions varying from +0.5 to +2.0, the medium containing an equal quantity of ascitic or pleuritic fluid that had been heated to 56° C. for one hour on 5 to 6 successive days. It is a micro-aerophile-anaerobe, growing under the anaerobic conditions of pyrogallic acid and caustic soda. Once isolated it can be propagated on ordinary nutrient agar and some suitable carbohydrate. It is Gram-negative, in litmus milk coagulation and acid, with waxy surface growth, resembling cerumen from the external ear: no growth on potato, but if pleuritic fluid be added a flocculent growth appeared. Fermentation of dextrose, levulose, galactose, lactose, saccharose, maltose, inulin, dextrin, raffinose, and mannose: mannite, erythrite, dulcite, and isodulcite were not affected. These tests were carried out according to Martin (*vide supra*). The morphology is comparable in all respects to forms observed in the mouth.

The cultivation of an organism was announced by Kliger (*Journal Allied Societies*, September 1915, p. 328) and named L. buccalis (Miller, Kliger). It is unquestionably distinct from the one cultivated by Wherry and Oliver.

A survey of Miller's "Micro-organisms" (1892) and Goadby's "Mycology" (1903) does not permit the absolute identification of the leptothrices there described with either of the two above-cultivated species, and therefore the names applied by Wherry and Oliver and by Kliger have undoubtedly the rights of priority, and hereafter should not be employed indiscriminately.

[*Dental Digest*, October, November and December 1916.]

Orthodontia of the Deciduous Teeth. By E. A. Bogue.

The classics of orthodontic bibliography confine themselves to the care of the permanent teeth. This is entirely unjustifiable. The biological significance of dental irregularities is that such are local symptoms of a general arrested development. It goes without saying that the sooner corrective measures are instituted the better for the individual and the race. A widespread superstition is that irregularities of the deciduous dentition are relatively rare. Bogue, on the contrary, is emphatic that they are as frequent as among permanent teeth. Perhaps this difference of opinion exists because formerly we have been looking for irregularities of the same kind as are seen in the second dentition. Bogue recognizes as abnormal the condition where at six years of age the deciduous teeth still remain perfectly regular and close together. This means irregularity of the permanent teeth.

Unless a perceptible spreading apart of these baby teeth begins before the third year of the child's life, the prognosis for regularity among the permanent teeth is unfavorable; if at four years the breadth of the upper dental arch between the lingual sides of the second deciduous molars at the gum margin is not at least equal to 28 mm., it is absolutely certain that the child has already suffered an arrest of development which it cannot surmount, and will not outgrow unaided.

These deficient conditions prevail in 96 per cent. of 543 children seen at the Forsyth Institute, and correspond with statistics from examinations of Cleveland school children.

Methods to overcome this subnormality are an outdoor life and exercise, deep breathing, mastication of hard and fibrous substances, administration of thyroid extract, and mechanical orthodontic intervention.

The early discovery and removal of adenoids and thorough performance of the functions of mastication and breathing are the surest preventives of irregularity of deciduous teeth.

The most important feature in the method followed by Bogue is perhaps the determination of how far the arches are to be spread. Wire arches are made over Hawley—adult—diagrams, as follows: To allow for normal anterior growth, which averages 3 mm., a line is drawn straight across the occlusal ends of the maxillary second deciduous molars, passing through the disto-palatal grooves to the buccal sides of these teeth. This line cuts off about 3 mm. of the distal portions of the teeth. The upper model is then cut into three pieces along the lines of a Y. The lateral portions each have three teeth and the front portion the four incisors. These pieces are then placed on a glass slab and the Hawley transparent chart placed over them. The three pieces of the model are aligned with this outline—the anterior surfaces of the two upper second molars lying over the lines drawn across the occlusal ends of the upper second deciduous molars—then waxed to the glass, and plaster poured between them, uniting them into one reconstructed model. This practically gives the size of the upper arch necessary for the permanent teeth to erupt without crowding.

The lower model is likewise treated and articulated with the reconstructed upper.

Expansion arches, adapted to these models, are placed upon the teeth, bringing these out to normal width. Retention may be secured by leaving these same arches on until the deciduous teeth are lost.

◆

PERISCOPE

Danger in Pressure Anesthesia.—The use of cocain pressure anesthesia, without regard to the presence of infection in the pulp, must be condemned as dangerous empiricism. The forcing of blood contaminated by bacteria and their products into the periapical structures in the endeavor to anesthetize the pulp results in some of the peridental difficulties which dentists and physicians alike are endeavoring to prevent. The field for cocain pressure anesthesia is limited, and its misapplication may result in a chronic focus of infection with all its attendant complications. —EDITORIAL, *Pacific Dental Gazette.*

Ionization in Sterilizing Root-canals.—A perfect method of sterilizing root-canals is to be found in ionic medication. In a tortuous or constricted canal the application of 2 or 3 milliampères of current for five or six minutes is sufficient to produce ions from a compound solution of antiseptic salts, which will penetrate the length of the canal, and sterilize it effectively. The saturation of the tubules with septic matter in long-standing purulent canals often makes ordinary antiseptic dressings too superficial and imperfect to accomplish complete sterilization; but by ionic medication with some powerful antiseptic salt, such as zinc chlorid or silver nitrate, the tubules are penetrated by zinc or silver ions, and perfect sterilization of the lining wall is effected. Five or six minutes will be sufficient to sterilize the canal, and two or three canals in one tooth can be done at the same time by placing electrodes in each and connecting them all with the current electrode. A 5 per cent. solution of zinc chlorid for anterior teeth or a solution of silver nitrate for posterior teeth are effective drugs for this treatment.—E. STURRIDGE, *British Dental Journal.*

To Re-cement a Loose Bridge Without Removing.—Frequently the gold-cap end of a large bridge comes loose while the other part is still firm. Drill a hole in the crown with a No. 7 bur, wash out and dry. Having selected a rubber cup, such as is used for polishing teeth, the mandrel serving as a handle, fill the cup with slow-setting cement, and pulling the loose end of the bridge off as far as possible, press the cup over the hole in the crown and slide the cup off the crown sidewise. Refill with cement and repeat until cement appears at the cervix. With the ball of the finger over the hole, press the bridge back to place. Fill the hole in the crown.—L. E. CUSTER, *Dental Summary.*

Prevention of the Necessity of Devitalizing a Tooth.—With our modern knowledge of the pathology and the cause of the oral abscess, it should be our greatest aim to prevent disease and loss of the dental pulp. Oral hygiene and prevention of decay becomes a still more important feature than ever before. But not only should we save the pulp from disease, we should also discontinue the practice of devitalizing the teeth for crown and bridge abutments. Bridges should be constructed which do not require devitalization of healthy teeth, and our efforts should be in the direction of devising reconstruction work which is not destructive to the remaining healthy tissue.—K. H. THOMA, *Journ. Allied Dental Societies.*

Prevention of Oral Abscesses.—We know that most abscesses come from imperfect root-canal treatments; we should therefore discontinue to treat hopeless conditions and realize that we deceive ourselves and our patients if we pronounce a tooth that has quieted down and does not give any acute trouble as "all right," because almost always it is "all wrong." With careful X-ray diagnosis it should be ascertained whether there is an abscess at the end of the root, and whether the canals are normal, straight and wide, or complicated, crooked and narrow. Only favorable cases should be treated. Unfavorable cases need surgical treatment—apicoectomy or extraction. After the canals are cleaned, a picture should be taken to show with the aid of metal indicators that the apical foramen has been reached. After the root-canal filling has been accomplished, we should take another roentgenogram to check up the result. Root-canal work should be undertaken under strictly aseptic precautions.—K. H. THOMA, *Journ. Allied Dental Societies.*

Stepping Margins in Amalgam Operations.—The most important factor in the entire manipulation of amalgam is the stepping of the margins. I have never been able to make a tight filling in a steel die unless I stepped the margins. It should be stepped half the diameter of the instrument all around every margin, and as you proceed take out the mercury. Three instruments are used in this process—one 3-16, one 3-32, and another about ⅛ inch. It is absolutely impossible to pack amalgam satisfactorily with round ball burnishers. If the instrument is too small, the amalgam creeps out from under it. We should be able to use approximately fourteen or fifteen pounds of pressure in condensing this material. The ability to create pressure with the hand of the average dentist has become a little minimized since we ceased to manipulate soft foil, but in the condensation of this material it will be found that it is very much better to use moderate size pluggers and step half the diameter around the margin, in this way condensing this material thoroughly.—T. P. HINMAN, *Michigan Dental Journal.*

Packing Rubber Plates.—Take a piece of pink rubber, four thicknesses for medium thick gums, five thicknesses for heavy, fold rubber on itself, being sure no air-spaces are between the layers. Make it whatever height you want the plate, by measuring height of gum wanted with calipers, then measure the length from the first molar on one side to the first molar on the opposite side.

For red rubber make a roll about two-thirds the size of a lead-pencil. If for diatoric teeth cut small pieces of rubber and pack in hollows of the teeth first. Take a roll of red rubber, start at the second molar, and run around to the second molar on the opposite side. Pack under all the pins first so as to be sure they are seated in red rubber. With an instrument pull the rubber back toward the lingual surface from the space between each tooth so that there is no chance for the red rubber to show through. Then take a pink piece and place it so that the lower part rests on the pins and press all to place nicely with the thumbs, following up by pressing with an instrument between each tooth, so that a uniform thickness of pink rubber is obtained. Take a flat-end instrument and unite at joint both rubbers. Then take a piece of red rubber so as to back up the pink, allowing it to cover the joint of the other two rubbers. Pack the remainder of the plate in the regular way.—J. M. HALE, *Dental Review.*

Preparation of Cavities for Gold Inlays.—The preparation of enamel walls is the last but most important part of cavity preparation, for the margin forms the most vulnerable portion of the remaining tooth substance. If there is a recurrence of decay it is at this point, and according to the treatment it receives will its chance for success or failure be measured. I believe in the beveling of the cavo-surface angle all around the cavity; I decry the butt joint and the lap joint, and will give the reasons for my belief. In the first place the histological structure of the enamel is such that once its continuity is broken it needs the support of the filling material, and all short enamel rods must be removed from the surface of the cavity if any degree of success is to be expected. In making the beveled margin the short enamel rods are all removed and an angle is provided for a flange that, being cast upon the inlay, provides a protection to the enamel that can be burnished to immediate contact with the tooth substance and make the closest possible joint. In the butt joint there is no protection of the enamel margins and there will be innumerable short rods left to fall out and leave vulnerable spots.—J. V. CONZETT, *Journ. Allied Dental Societies.*

The Splint in Treatment of Fractures.—A score of years ago the favorite splint for the treatment of maxillary and mandibular fractures was the vulcanite interdental splint, so constructed that several openings were left, through which food was administered. This splint required that the head be bandaged to keep the lower teeth securely set in the depressions constructed for them. Later, the Kingsley splint, afterward modified by Dr. Flanagan, was found to be of greater value and to give greater comfort in mandibular fractures. This splint was constructed of vulcanite for the lower teeth only and had heavy metal arms vulcanized into the body of the splint, which projected from the corners of the mouth and were bent backward again to reach as far back as the angle of the ramus. Sufficient space was left for the looping back and forth of a bandage, above which padding was placed to prevent too great pressure upon the point or points of fracture. The bandage pulling the arms downward and pressing upward upon the bone held the splint firmly against the teeth. Then a splint, consisting of gold bands fitted to two or more teeth, united by stiff gold wire and cemented to the teeth, was found a very great improvement.

Unless accompanied by dislocation, fractures involving only the body of the mandible may best be treated either by the application of a metal splint cemented on to the teeth or by looping brass wire around the antagonizing teeth and drawing the jaws into occlusion.

In very many cases, where the ramus is also fractured, it has been found that after the teeth have been brought into occlusion and the jaws at rest a remarkably good union takes place without resort to any operation for the surgical application of either a wire suture or a silver plate.—J. M. MAGEE, *Dominion Dental Journal.*

Bridge Abutments.—These are commonly some variety of crown. The strongest are the barrel crown for posterior, and the Richmond for anterior teeth. I frequently use inlays as abutments and believe that they can be made to do good service, provided always that they are large enough to stand the strain imposed upon them, that they protect the cusps of the teeth, and are strengthened by a post whenever possible. For a sound anterior tooth which is to be used as a pier for a bridge, no form of abutment which I have ever seen can compare with the combination of a post and inlay, which might be called a "half crown." I have used this abutment for years now, and have never seen one go wrong. The chief advantage lies in its appearance, for no anterior crown ever made could compete with the natural tooth in "naturalness." In addition it is very strong, and in upper teeth the force of mastication tends but to seat it the more firmly. It is an ideal abutment for the type of bridge so often seen which has a canine for one of its piers. The method of construction is as follows: The tooth is anesthetized by an intra-osseous injection and the lingual enamel ground away. The pulp chamber is opened into with a round bur, the pulp removed, and the apex sealed. The canal is reamed out to receive a stout iridio-platinum post, and a vertical groove is cut in the lingual surface with a cylindrical carborundum stone or a large fissure bur extending labially a little beyond the opening of the root-canal, and having a flat floor below the gum margin. This gives aditional strength where the post is attached, and allows firm anchorage for the inlay. The mesial, distal, and incisal margins are beveled, so that they are protected by gold when the operation is completed. The post is inserted in the canal, and inlay wax flowed around it, restoring the original contour of the tooth, a sprue inserted, and the pattern removed and cast.—C. T. MCKINLEY, *Australian Journ. of Dentistry.*

HINTS, QUERIES, AND COMMENTS

A Dental Anomaly.

To the Editor of the Dental Cosmos:

Sir,—I desire to report the following case, that to me was very peculiar. The patient, a man of fifty years of age, had been suffering from rheumatism for months. A tooth was suspected and an X-ray examination was made. Fig. 1 shows the root split, and the long part of the mesio-buccal root moved directly away from the remaining portion of the root fully one-fourth of an inch at the apex. Careful observation will show the transverse fracture of the broken piece next to the neck of the tooth. Fig. 2 is a photograph of the tooth after extraction, with the piece in position as it was in the jaw. The question is, What split the root, and how did the fractured piece get into that position? It has been suggested that the process was destroyed in such a way as to allow it to move. I have not even a theory as to what would split a root in this manner. Any suggestion would be appreciated.

Fig. 1.

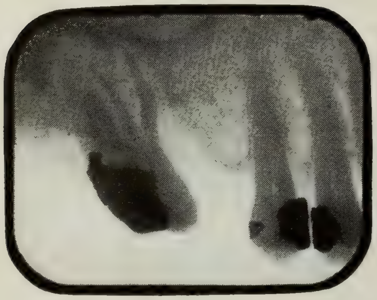
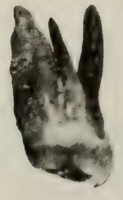


Fig. 2.



Very truly,

K. L. Freeman, D.D.S.

Battle Creek, Mich.

Suggestions on Inlay Casting.

To the Editor of the Dental Cosmos:

Sir,—The usual method of cleansing an inlay pattern and preparing it for investing seems to be to go over it with a small brush or pledget of cotton saturated with alcohol. A more efficacious and otherwise preferable method is to *wash* it in a tube partly filled with alcohol. Test tubes may be used, but tubes in which gold cylinders are supplied are preferable.

One or more holes slightly smaller than the sprue to be used should be drilled in the cork. With the pattern securely fixed, wire is grasped with a pair of pincers, and the end is forced into one of the holes in the cork; insert the cork and shake the tube a few times. Cleansing is perfect, and there will be no trouble in getting the investment to adhere perfectly. Should it not be desirable to invest immediately, simply leave it in place until wanted. Some inlay waxes are found to be affected by alcohol; of course this should be kept in mind.

A frequent cause of irregularities in the surface of inlays is due to an excess of alcohol being left on the pattern when the investment is made.

Alcohol affects materially the setting of plaster, so the model should preferably be dry. For applying the investment, use a brush moistened with *water,* but have no surplus in the brush.

A word as to sprue wire. I have seen used graphophone needles, iron and brass wire, shanks of burs, nails, etc. A dime's worth of brass pins from the stationer will last a year, and are ideal. At least two sizes should be used. Remember that if a sprue too large be used with any considerable mass of gold, there is a tendency for some of the semi-fluid metal to be forced downward by its own weight before the operator is ready to cast. To avoid this use a smaller sprue, and more than one if necessary.

For compound approximal cavities, bend a long pin into a V shape, insert both ends into the model while in the cavity, remove, and invest. To remove the sprue from the investment, cut diagonally through one side of the sprue, and removal is as easy as when a single sprue is used.

S. Preston.

Roanoke, Va.

A Method of Making Bridge Abutments on Vital Teeth.

To the Editor of the Dental Cosmos:

Sir,—May I add a mite regarding the question of septic bridge work?

I believe that there is such a thing as having a dental bridge too permanent, and that it is a good thing occasionally to have a bridge come loose so that it can be cleaned, the abutments all made "sweet" again, the old cement removed, and the bridge generally put in good shape—the same as one would overhaul any piece of machinery.

It is my practice now, when a patient wants an anterior bridge, say from one to four teeth, and the piers are in good shape and vital, to disk the sides of the teeth somewhat, with sandpaper disks, to remove the contour slightly, but not going through the enamel. I then roll pure gold to about half the thickness of 30-gage and fit a band a full one-eighth inch wide around the tooth as far up as I can go, being sure that it fits. Then I fit another band of the same material over the first band and solder the two together solidly and build my bridge upon these bands.

A rigid band is essential, as it is hopeless to expect to fasten a springy band with cement. I have had much satisfaction from such work. Formerly I would have devitalized the teeth and made Richmond abutments or drilled holes in the teeth to cement pins into through a backing. I do this now in many cases where cosmetic reasons are paramount, but generally, where the appearance of a band is not contra-indicated for cosmetic reasons, I use the band and leave the teeth vital. I wish someone would invent an enamel that could be fused on gold as is bathtub enamel on iron—so that we could enamel the bands in banded bridges.

I think more of vital teeth than I did, and I put off the day of devitalization as long as possible.

F. A. Graham, D.D.S.

Harbor Springs, Mich.

A Case of "Mottled Teeth"?

To the Editor of the Dental Cosmos:

Sir,—I have read with much interest the articles by Dr. Black and Dr. McKay in the Dental Cosmos during the year on "Mottled Teeth." Yesterday a patient called at the office to have a tooth filled. He told me that his teeth at one time were of very good quality, hard and sound, but since coming to this community, about three years ago, they had become soft and looked yellow. I examined his teeth and found them to be just as he had stated. He asked me what the cause of this change was, and I told him about the studies of Dr. Black and Dr. McKay, and that this condition had been found to be due to drinking water from artesian wells in many cases; and to my surprise he told me he had an artesian well on his farm, and used the water for drinking and household purposes.

Yours truly,

M. Williams.

Wheaton, Minn.

OBITUARY.

Dr. Gordon White.

[SEE FRONTISPIECE.]

DIED, at his home in Nashville, Tenn., December 6, 1916, in his fifty-ninth year, GORDON WHITE, D.D.S.

Dr. White had been in ill health for nearly five months, but not until three days previous to his death was he stricken with his last illness.

Dr. White was the son of Thomas Cathy and Nitia (Gordon) White, and was born in Pulaski, Tenn., on January 3, 1857. He came from a long line of distinguished forefathers residing in Kentucky, the Carolinas, and Virginia. When but a lad of eleven years the death of his father threw upon him the burden of self-support and the care of the family. He spent his boyhood days working in the spring on the farm, and attended school in the autumn and winter.

Leaving the Giles Military College at Pulaski at the age of eighteen, he entered the office of Dr. J. Tol Grant of the same city and began the study of dental surgery. At the same time he studied medicine under Dr. W. E. Wilson of Pulaski. At the age of nineteen he entered the old Baltimore College of Dental Surgery, where he remained until he received his degree of Doctor of Dental Surgery in March 1879, being graduated as one of the highest in his class.

Shortly before Dr. White's graduation the family moved to Nashville, where he joined them and at once entered upon practice, and early came to be recognized as an authority on subjects treating of dental science. He specialized in the treatment of pyorrhea alveolaris.

In 1889 he became president of the Tennessee Dental Association, and in 1892 was made president of the Southern Dental Association. In 1900 he was the Southern representative from the National Dental Association, appointed by the United States government, to the Medical and Dental Congress at Paris, France. In 1902 he was named as delegate from the National Dental Association to the International Congress at Stockholm, Sweden. In 1904 he represented the International Dental Federation at the International Dental Congress in St. Louis, and later was one of the honorary presidents of the congress.

Other societies of which he was a member are Sigma Delta fraternity, Nashville Society of Dental Surgery, Nashville Academy of Medicine, Tennessee State Medical Association, the American Dental Association, and the American Medical Association. He was also associate member of the First District Dental Society of New York and an honorary member of the American Dental Society of Europe.

Although he never was connected with the faculty of any college, he read papers and gave lectures before schools and medical and dental associations. In a small way he was an inventor, and made many little instruments now in use by the profession.

Although versed in all that related to his profession, Dr. White confined his literary labors to the papers which he read.

In his home life he was very fond of reading and of pictures. He had a large private collection of books, paintings, and etchings.

He was not married. Throughout his life he was steadily devoted to his mother, who with two sisters, Mrs. A. J. Hood of Brownsville, Tex., and Miss Mary Lou White of Nashville, survives him.

A simple funeral service was held at his residence on the afternoon of December 6th, after which his remains were taken to Pulaski for interment at the old home place. Twenty lifelong friends, many of whom were professional colleagues, acted as honorary pallbearers.

Dr. George Lindsey Field.

Died, at Detroit, Mich., October 28, 1916, as the result of a broken hip incurred in a street-car accident, George Lindsey Field, D.D.S., in his eighty-second year.

Dr. Field was born in England, April 19, 1835. He came to America in early boyhood and began his dental career as an indentured apprentice in the office of Dr. C. W. Spalding of St. Louis, Mo., in the fall of 1851, when only sixteen years of age. Three years later he associated himself with Dr. H. J. McKellops of St. Louis as laboratory assistant. In 1856 he began the practice of dentistry for himself in Huntsville, Mo., but remained in that place for only a few months, when he returned to Detroit, the home of his boyhood, and began practice under the handicap of lack of money or other helpful influences. He had achieved a good degree of technical skill during and after his apprenticeship, and after a tedious struggle to get established he acquired a large and lucrative practice for his day. He was a genial and courteous gentleman, always held a strong social position in the city of Detroit, and had a host of warm friends wherever he was known.

Dr. Field helped to organize the State Dental Society and the Detroit local society, as well as many of the district societies. He gave liberally of his time and talents to promote dental society work. He always attended the state and national dental meetings, and did much to make their programs interesting and instructive. He was president of the Michigan State Dental Society for three years, also of the Detroit Dental Society for three years. He was professor of clinical operative dentistry in the dental department of the Detroit College of Medicine for the entire time of its existence—about fifteen years. He was always interested in the dental department of the State University, and was largely instrumental in its establishment. He was respected, honored, and loved by his professional *confrères*. When he retired after about fifty-six years of active practice in Detroit, the Detroit and Michigan dentists gave him a testimonial banquet, and presented him with a silver loving-cup. He was an active member of Delta Sigma Delta Fraternity.

Dr. Field is survived by his wife and a married daughter.

"In Memoriam" Resolutions.

Dr. Norman G. Reoch.

The American Academy of Dental Science adopted the following resolutions on the death of Dr. Norman G. Reoch:

Whereas, our beloved Fellow, Dr. Norman G. Reoch, has been removed from us by divine Providence, it is fitting that we should make a record of his death, and express our sorrow over the untimely close of a successful career; and

Whereas, by his genial disposition, his skill as a practitioner of his chosen specialty, he has been a credit to the dental profession; therefore be it

Resolved, That we, the Fellows of the American Academy of Dental Science, feeling deeply the loss we have sustained, hereby express our appreciation of his friendship, and our sorrow at his death; and be it further

Resolved, That these resolutions be spread upon our minutes, and that a copy be sent to the widow and his family.

John W. Forbes.
Frank T. Taylor.
Lawrence W. Baker.

Dr. David W. Cheever.

The following preamble and resolution on the death of Dr. Cheever were adopted by the American Academy of Dental Science:

Dr. Cheever, who died in Boston, December 27, 1915, was an Honorary Fellow of the American Academy. He was a man of sterling character, and a leader in his profession, very prominent in the medical and surgical world. He died just as he was entering his eighty-fifth year. He was a broad and noble-minded man, having an abundant love for his profession. He not only worked faithfully as a great surgeon and teacher, but also lifted his associates to high and still higher aims.

Dr. Cheever was born in Portsmouth, N. H., November 30, 1831. His father and grandfather were physicians. He served the Harvard Medical School for thirty-three years as teacher and professor. He was connected with the Boston City Hospital for fifty-two years. His loss to the entire surgical world is a deep and lasting one. Therefore be it

RESOLVED, That the American Academy of Dental Science has lost one of its most esteemed Honorary Fellows, and his profession a noble leader. His memory will be revered by all who love high character, noble service, and the sterling attributes of the finest type of man.

R. R. ANDREWS,
EDWARD C. BRIGGS,
FORREST G. EDDY.

SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS *not later* than the 11th or 12th of the month preceding that of publication.

Minnesota State Dental Association.

THE thirty-fourth annual convention of the Minnesota State Dental Association will be held February 23 and 24, 1917, at the University of Minnesota, Minneapolis, Minn.

MAX E. ERNST, *Sec'y*,
51 Loury Bldg., St. Paul, Minn.

University of Iowa, College of Dentistry.

CLINIC AND MEETING OF THE ALUMNI.

THE clinic of the College of Dentistry of the University of Iowa, and meeting of the Alumni Association will be held in Iowa City, Iowa, March 7 and 8, 1917.

F. B. WHINERY, *Sec'y*.

Missouri State Dental Association.

THE Missouri State Dental Association will hold its fifty-second annual meeting in St. Joseph, Mo., April 4, 5, and 6, 1917. A splendid program is in course of preparation, which will include a number of papers by the strongest men in the dental profession, dealing with subjects of special interest to every dentist.

A first-class clinical program is also in course of preparation, which will include new ideas and new methods of practice. The manufacturers' exhibit will present the newest materials and instruments used in dentistry.

J. F. WALLACE, *Sec'y*,
Canton, Mo.

Pennsylvania State Dental Society.

THE forty-ninth annual meeting of the Pennsylvania State Dental Society will be held in Philadelphia, June 26, 27, and 28, 1917, at the Bellevue-Stratford Hotel.

J. F. BIDDLE, *Sec'y*,
Pittsburgh, Pa.

Virginia State Dental Association.

THE Virginia State Dental Association will meet in Norfolk, April 17, 18, and 19, 1917. All members of the National Dental Association or any state society are cordially invited to attend.

C. B. GIFFORD, *Cor. Sec'y*,
Norfolk, Va.

Forsyth Dental Infirmary for Children.

NEW DEPARTMENT—LIBRARY AND MUSEUM.

THE trustees and director of the Forsyth Dental Infirmary for Children have authorized the creation of a new department, to be known as the "Library and Museum." They solicit from the dental profession contributions of books and dental periodicals, particularly those out of print and not readily obtainable by purchase, also specimens of dental abnormalities, casts, or specimens of unusual structures of dental interest, for all of which permanent acknowledgment will be given.

FREDERICK A. KEYES, D.M.D.,
Librarian and Curator of Museum.

Michigan State Dental Society.

DETROIT, the wonder city of the middle west, will be the meeting-place for the sixty-first annual meeting of the Michigan State Dental Society, April 12, 13, and 14, 1917.

The growing necessity for individual efficiency in dental operations should find seven hundred out of the eight hundred members of the society present. "It is for better dentistry."

All ethical dentists are invited to attend and become members, and members of other associations are cordially invited.

C. G. BATES, *Sec'y,*
Durand, Mich.

Kentucky State Dental Association.

THE next annual meeting of the Kentucky State Dental Association will be held in Louisville the three days previous to the Kentucky Derby, May 9, 10, and 11, 1917. Address all correspondence to

W. M. RANDALL, *Sec'y,*
Louisville, Ky.

Susquehanna Dental Association of Pennsylvania.

THE fifty-fourth annual meeting of the Susquehanna Dental Association of Pennsylvania will be held in Odd Fellows' Hall, 118–22 N. Ninth st., Allentown, Pa., May 22, 23, and 24, 1917.

GEORGE C. KNOX, *Sec'y,*
300-301 Dime Bank Bldg., Scranton, Pa.

Dental Society of the State of New York.

THE forty-ninth annual meeting of the Dental Society of the State of New York will be held in Convention Hall, Rochester, N. Y., May 10, 11, and 12, 1917, including the literary program, clinics, and exhibits.

Note that the dedication of the Rochester Dental Dispensary—the gift of Mr. George Eastman to the city of Rochester—will take place on Wednesday, May 9th, and the profession is cordially invited.

This the forty-ninth will be our banner gathering, because of the favorable location and the well-known ability of the Rochester dentists to stage a successful meeting. All ethical dentists are cordially and fraternally invited. The Executive Council will meet in Buffalo on the afternoon of May 9th, organize, and then adjourn, to meet in Rochester the following day.

Exhibitors are cordially invited. For space and rates address Dr. E. G. Link, Cutler Bldg., Rochester, N. Y.

For programs and general information address

A. P. BURKHART, *Sec'y,*
52 Genesee st., Auburn, N. Y.

North Carolina Dental Society.

THE North Carolina Dental Society will hold its forty-third annual meeting at Durham, N. C., June 27, 28, and 29, 1917.

R. M. SQUIRES, *Sec'y,*
Wake Forest, N. C.

Connecticut State Dental Association.

THE fifty-third annual meeting of the Connecticut State Dental Association will be held at the Hotel Griswold, New London, Conn., June 14, 15, and 16, 1917.

Papers and clinics of unusual interest have been secured, which with the excellent accommodations offered by the Griswold, will make this one of the most attractive meetings in the history of the association.

GEO. S. B. LEONARD, *Sec'y,*
Mystic, Conn.

Postgraduate Dental Meeting:

Alabama, Mississippi, Texas and Louisiana.

THE states of Alabama, Mississippi, Texas, and Louisiana will hold a joint postgraduate meeting on June 4, 5, 6, and 7, 1917, in New Orleans, La. This will be immediately followed by a special detailed technical course, negotiations for which are being made with some of the most talented clinicians throughout the country.

In order to encourage attendance from other states, the committee have concluded to start a campaign of wide publicity, and from time to time will issue detailed announcements of the progress being attained.

J. P. WAHL,
Maison Blanche Bldg., New Orleans, La.
Chairman Publicity Committee.

New Jersey State Dental Society.

The forty-seventh annual convention of the New Jersey State Dental Society will be held at Atlantic City, N. J., on July 11, 12, and 13, 1917.

The entire convention will be held on Young's Million Dollar Pier. Machinery Hall will be used for the exhibits. Dr. George W. Wakeley, of Orange, N. J., is chairman of the committee, and with 25,000 square feet of space available, expects to have the greatest display of dental goods in the history of the society. Machinery Hall extension, with about 10,000 square feet of space, will give ample space for clinics and meetings.

Dr. Charles A. Spahn of Newark, N. J., is chairman of the Clinic Committee, and will present some entirely new clinics. Dr. Raymonde A. Albray of Newark, N. J., chairman of the Essay Committee, has arranged for essayists of prominence, whose names will be announced later.

The headquarters of the society will be on the pier, and mail may be directed to exhibitors, clinicians, or members in care of the secretary of the New Jersey State Dental Society, Young's Million Dollar Pier, Atlantic City, N. J. A list of hotels where special rates may be secured will be published in the *Journal*, and mailed prior to the convention. A cordial invitation is extended to all ethical practitioners.

John C. Forsyth, *Sec'y*,
430 E. State st., Trenton, N. J.

Massachusetts Board of Examiners.

A meeting of the Massachusetts Board of Dental Examiners, for the examination of candidates, will be held in Boston, Mass., March 20 to 23, 1917, inclusive. For further information address

George H. Payne, *Sec'y*,
29 Commonwealth ave., Boston, Mass.

New Hampshire State Dental Board.

The New Hampshire State Dental Board will hold its next examinations on June 28, 29, and 30, 1917, in Masonic Banquet Hall, Manchester, N. H. Application blanks and further information may be obtained of

Harry L. Watson, *Sec'y*,
913 Elm st., Manchester, N. H.

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UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING DECEMBER 1916.

December 5.

No. 1,207,566, to Alfred Korbitz. Orthodontic appliance.

December 12.

No. 1,207,703, to Horace E. Basehore and Edward L. Kraft. Amalgam-mixer.

No. 1,207,756, to Clarence A. Holmes. Rubber-dam holder.

No. 1,207,895, to Edmund D. Gilbert. Tooth-shade guide.

No. 1,208,244, to Harry F. Waite. Dental film-developing apparatus.

No. 1,208,501, to Samuel A. Crocker, Jr. Dental tool.

December 19.

No. 1,209,111, to Sophia D. Brelsfoard. Cover for toothbrushes.

No. 1,209,142, to Thomas F. Glenn. Artificial tooth.

No. 1,209,176, to Robert D. Leary. Brush.

No. 1,209,499, to Napoleon B. Riddle. Dental matrix-retainer.

No. 1,209,516, to Charles E. Thompson, Toothbrush.

No. 1,209,570, to Wm. St. George Elliott, Jr. . Artificial tooth and denture.

December 26.

No. 1,209,789, to Wm. E. Wilson. Dental instrument.

No. 1,209,906, to Fredus A. Thurston. Method of making gold inlays.

No. 1,210,052, to Charles H. Davis. Grinding device.

ARTHUR SWAYNE UNDERWOOD, M.R.C.S., L.D.S.E.

THE

DENTAL COSMOS

VOL. LIX. MARCH 1917. No. 3.

ORIGINAL COMMUNICATIONS

Preventive Dentistry.

By RUSSELL W. BUNTING, D.D.Sc., Ann Arbor, Mich.

(Read at the union meeting of the Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York, Buffalo, November 24, 1916.)

SOME three years ago we were told by a prominent member of the medical profession that the further advancement of the science of preventive medicine depended upon our ability to eliminate oral infections which might be harmful to the health of the whole economy. The efforts of medical investigation and practice have been directed largely in late years toward the prevention of disease, with the result that the death-rate has been decreased, living has been made more comfortable, and years have been added to the span of life. And now we, as dentists, are told that further progress along these lines is dependent upon our ability to prevent the entrance of infection to the body through the avenue of the mouth.

We have heard and responded to the call. We have made wholesale examinations of our patients by the X-ray and other methods of diagnosis to determine to what extent oral infections exist. We have been astonished by the information which we have gained, and by the frequency with which sepsis occurs even under conditions which had formerly seemed to us to be most favorable. Moreover, certain members of our profession, by study and experimentation, have demonstrated that these oral infections have the property, in some instances, of producing lesions and metabolic disturbances of tissues and organs of the body far remote from the original seat of infection. The result has been the awakening of a keen interest in oral infections among dentists, the medical profession, and the laity.

In a consideration of the entrance of infections of various orders to the tissues of the body, we know that nature has built up a strong and efficient barrier against such organisms. Disease-producing bacteria exist all about us, and would annihilate the whole race in a short space of time were it not for the defenses of the individual against the entrance and propagation of such bacteria in the tissues. The skin and mucous membrane are the external defenses, and when intact and in health there are but few organisms which can penetrate them. In the mouth, therefore, pathogenic and non-pathogenic bacteria may have their habitation in large numbers and be entirely harmless to the body, as long as the mucous membrane of the mouth remains intact. It is when a lesion in this protective covering has occurred that infection may enter the oral tissues to produce local or general effects.

AVENUES OF ENTRANCE OF INFECTION TO THE SYSTEM.

The most vulnerable spot in the mucous membrane covering of the mouth is to be found in the gingival tissues, the openings through which the teeth are pushed in eruption, and which exist as long as the teeth remain in position. It is in these places that the integrity of the protective covering is most easily and frequently broken, and through which infections may most readily gain entrance to the deeper tissues. In addition to the lesions of the mucous membrane, the integrity of the teeth is destroyed by dental caries offering a means of access for infectious organisms through the cavity in the tooth and the root-canal to the tissues of the periapical space. Through these two avenues the great majority of oral infections enter the tissues to produce their specific results. These are the gateways of infection which lie within our domain, for the closure of which preventive medicine has asked our co-operation.

Dentistry is everywhere rising today to meet the demand. Every effort is being turned toward the eradication of periapical and peridental infections. Methods of diagnosis and treatment of dental abscess and pyorrhetic conditions are being perfected whereby serious oral infections are being eliminated and the tissues restored to normality—all of which has been of great service to medical practice in the treatment of many general disease conditions of an infectious nature. The demand for such service is universal, and the amount of oral disease to be remedied is almost appalling, so that dentistry will be very busy during the next few years in diagnosing and eliminating the untoward conditions which exist in the mouths of a large percentage of the people. But praiseworthy as this form of treatment may be, it falls short of the ideal service, in that it often fails to repair the damage which has been done, or to entirely eliminate the harmful foci of infection. The ideal dental service is that by which the lesions through which the infections originally enter will be prevented, and the normal protection of the body be conserved. Could dentistry prevent the occurrence of dental caries through means by which the teeth would remain intact, and peridental or gingival infections, by which the normal resistance of mucous tissues would be conserved, the mouth would be most effectively eliminated as a source of general infection. It is, then, the duty of Dentistry, if she wishes to fill her place in the great work of preventive medicine, to turn her attention and to exert her best efforts toward the control and eradication of these two dental diseases.

SUSCEPTIBILITY AND IMMUNITY TO DENTAL DISEASE.

In a consideration of the problem of prevention of dental lesions we note that a certain small percentage of people go through life seemingly immune to dental disease, and that certain others are but slightly susceptible, in distinct contrast to the majority, who frequently suffer from one or both forms of dental disease. Two questions suggest themselves for solution, namely—

(1) What oral conditions determine immunity to dental disease?

(2) May immune conditions be produced artificially in mouths which are naturally susceptible?

In regard to the first question, we observe that a general bodily health and a well-developed physique usually imply that the tissues of the mouth are well formed, well nourished, and resistant to disease. We also note that certain environmental states exist in immune mouths which preclude their injury from infective or irritating materials. For instance, the lactic acid organisms of caries exist and produce their characteristic fermentations in the mouths of immunes as well as in those of susceptibles, but physical or physico-chemical conditions prevail in the mouths of the former which prevent the decalcification of the teeth and the inception of caries. These determinal conditions which control the occurrence of dental caries have been discussed theoretically in many contributions to that study, and cannot well be considered in a treatise of this nature. One general feature is very evident: that in all types of mouths those surfaces which are continually cleansed by the force of mastication are usually immune to caries. Such surfaces are frequently rubbed by the excursions of food across them, and other forces of mastication also interfere with the localization of caries bacteria, whereby their characteristic action is prevented. Therefore it may be stated that, as a rule, the more self-cleansing the teeth are, the less susceptible are they to caries. This self-cleansing property is dependent upon the anatomical form and arrangement of the teeth, the smoothness of their surfaces, the character of food—hard or soft—which is eaten, the thoroughness with which mastication is performed, and the viscosity and quantity of the saliva. In the light of our present knowledge, these are evident and potential factors in the production of dental caries.

Pyorrhea and peridental diseases almost invariably begin as inflammation of the gingival tissues. These inflammations may be the result of trauma, such as impaction of food during mastication, accumulations of calculi on the teeth, or malocclusion. It may also be produced by chemical irritants such as drugs or the products of fermentation and other bacterial action. The effect of such local irritations may be enhanced by or combined with disturbances of circulation due to systemic causes. In case of immunity to peridental disease we see that one of two conditions obtains—namely, either the gingivæ are not subjected to harmful or irritating influences, or the character of the circulation is so good that the health of those tissues is maintained in spite of the untoward conditions.

Natural immunity to dental disease is therefore largely dependent upon the full normal health and physiological function of the dental tissues combined with the absence of extraneous substances capable of producing injury. In answer, then, to our second question, regarding the possibility of artificially producing immunity to dental disease, we may say that it is most nearly approximated by those measures which assist the mouth to perform its full normal function and tend to continuously rid the oral tissues of harmful or irritating agencies.

MEANS OF ASSISTING NATURE IN THE PREVENTION OF DENTAL DISEASE.

What, then, are the means by which we may assist nature in the prevention of dental disease? According to our present knowledge such assistance may be classified in three groups:

(1) Those measures by which the teeth may attain their full development and be brought into normal relation with each other.

(2) The restoration of anatomical forms in teeth which have been mutilated by disease, and the replacement of teeth which have been lost.

(3) The cleansing of the teeth of all extraneous material, and teaching the patient to give intelligent mechanical assistance in maintaining oral hygiene.

Theoretically, there is reason to believe that the application of such measures would result in the reduction of dental disease of both orders, and this has practically proved to be true. For many years there have been certain members of our profession who have devoted themselves largely to the practice of oral prophylaxis, intensively directing their energies to these three general lines of procedure. The reports of these operators and examination of their cases show an unmistakable improvement in oral conditions. In a large number of cases peridental disease has been arrested, and in practically all cases its primary inception has been prevented. Dental caries is not so successfully prevented as are peridental diseases, but the progress of caries is usually impeded, and in a large percentage of cases the teeth seem to be practically free from attack. The validity of these statements has been corroborated by the author in observing the changes in mouth conditions which have occurred in over fifty patients who have been given personal treatment along these lines. These patients were suffering from one or both of the two common dental diseases, many of them being very seriously affected. The results of the application of preventive measures after two years of observation have been that practically all peridental disease has been arrested, and no new involvement is to be seen. But six cases of recurrence of caries have been found, although several of these patients were presenting that number each year previous to the inauguration of the preventive measures. These personal observations have convinced the writer that such oral hygienic and prophylactic measures when completely carried out *do* prevent dental disease in a large number of cases, and in every instance the resistance of the dental tissues is raised.

The fact that the practice of oral hygiene does not always prevent dental disease does not indicate that it is ineffective. The problems of preventive dentistry are not unlike those of preventive medicine. The latter are largely concerned with the control of infections which are the active cause of the large number of infectious diseases to which man is susceptible. If by some means preventive medicine could accomplish the complete annihilation of all disease-producing bacteria, the great majority of human ills would thereby be prevented, and the span of life would be lengthened by many years; but this, at the present time, is impossible. Medicine has therefore sought to make the most of its knowledge, incomplete though it may be, in seeking to reduce the susceptibility to infection in the individual and to increase bodily resistance against disease organisms. The results obtained in the prevention of smallpox, typhoid, diphtheria, tetanus, cholera, tuberculosis, and many other infectious diseases are eloquent evidence of the efficacy of the measures employed, in spite of the fact that they are not equally effective in all cases.

So, also, in the practice of preventive dentistry by means of oral hygienic measures, it is not possible to remove all infection and all unfavorable influences which may exist in the mouth, but it is possible to reduce them, and at the same time to increase the health and resistance of the dental tissues. In this manner the balance between the strength of the attacking force and the resistance of the tissues is swung toward immunity and away from susceptibility. Within certain limits the thoroughness with which the prophylactic measures may be or are carried out will determine the degree of immunity attained. In some cases dental disease will be prevented, while in others it will be made less frequent of inception and less virulent in attack.

ORAL HYGIENE AND PROPHYLAXIS THE ONLY PRACTICAL MEANS OF PREVENTION.

The principles of oral hygiene and prophylaxis, when practiced in their broadest sense, are inhibitive of dental disease, and as they are at the present time the only known practical methods of prevention they may well be called the principles of preventive dentistry. But if these principles are to be of real value in preventive medicine, the practice of them must not be limited to the specialist who devotes his whole attention to one particular phase. True it is that those who give their whole time and thought to such practice may most effectively apply the principles involved, but the scope of such men is altogether too limited to reach the masses in dental practice and to make dental prevention the general good which it should be. It rests, then, with the general practitioner to apply these principles in the daily routine of his dental operations. He must learn to recognize the unfavorable influences in the mouth and to seek co-operation on the part of his patients in their removal. In this manner he will most effectually keep the mouths of his patients in health, and prevent a large part of dental disease.

APPLICATION OF THE PRINCIPLES OF ORAL HYGIENE IN GENERAL PRACTICE.

Let us consider briefly the application of the principles of oral hygiene to the general practice of dentistry. It is evident that the assistance which is to be given to the development and arrangement of the dental tissues can most effectively be applied during early childhood. Proper advice to parents as to the care of the mouth and teeth of their children has often a profound effect. It is also important to warn them against excessive use of soft and pappy foods in the diet of the child, teaching them that vigorous and thorough mastication of hard foods is a great stimulus to the proper growth of all dental tissues. It is at this age that the most may be done for children in the way of orthodontic assistance, by which teeth in abnormal relations may be corrected and given the opportunity to properly functionate throughout the life of the individual—a factor of great importance in the prevention of dental disease. It is not always possible to obtain, nor may we expect, intelligent co-operation on the part of these little patients, so that in a large percentage of cases, especially where the forces of disease are severe, cavities appear in the teeth. Frequent examinations are therefore necessary to assist in the cleansing of the mouth, and to discover and fill the cavities when they are small. In this manner the teeth of the child may be preserved free from abscesses and in full function, to play their normal part in the physiological exchange of dentitions.

In this connection we shall be interested in the development of an institution in this section which aims to practice these principles of child hygiene and preventive dentistry upon a large scale. It is the purpose of the Eastman Dental Infirmary to direct all the work which they do for children toward the prevention of dental disease and the assistance of the dental tissues to attain their full normal development. The work of this institution during the next ten years will be a huge experiment in child hygiene and dental prevention, the results of which will be of inestimable value in judging the real efficiency of such preventive measures.

IMPORTANCE OF RESTORATIVE OPERATIONS AS AN AID TO ORAL HYGIENE.

In the treatment of patients who have passed the formative period somewhat different conditions prevail. Here we usually find lesions of dental tissues of one or both orders. Palliative and reparative treatment is therefore indicated. Fillings, crowns, bridges, plates, etc., are necessary to replace tissues lost by dental disease, but the important feature from a preventive standpoint is that these restorations shall restore the teeth to their full anatomical contour, and give normal occlusion and interproximal contact. High and definite marginal ridges on the molars and bicuspids, and proper mesiodistal contours, affording tight approximal contacts between all the teeth, have a most important function in the self-cleansing of the mouth. When operative measures are performed with these principles in mind the food is more effectually masticated and is directed away from the interproximal spaces rather than into them. Many practitioners perform all their operations with a view to restoring these anatomical relations in their own work, but overlook certain fillings with flat occlusal surfaces and overhanging gingival margins which have been doing a pernicious service for some time. Many such fillings may well be replaced, even though there is no recurrence of caries around them, and others may be reshaped and made to fairly well conform to the normal by a little judicious grinding and polishing. The "tin can" type of gold crown, with its ill-fitting and irritating edges, is a too frequent type of malefactor, in the presence of which preventive dentistry is impossible. So also are all the other forms of reparative dentistry which do not conform to the normal contour and relations of the teeth. It is gratifying to see that all the modern forms of operative and prosthetic procedures are in every way attempting to conform to the highest anatomical ideal, and practice of this character will most effectively assist in the self-cleansing of the mouth.

Another very important feature is the relief of undue and unnatural stress of one tooth upon another. We frequently see cases in which teeth come into occlusion by a sliding action, in which they and their antagonists are deflected laterally each time the teeth come together. The result is an undue strain upon the peridental tissues, which induces injury and infection. All of this may usually be remedied by the judicious use of stones and carbon paper.

PROPHYLAXIS.

With regard to the measures known as prophylaxis of dental tissues much has been said and written in the past few years which cannot be given a full consideration at this time. There are, however, certain salient features which are of special importance and deserve to be mentioned. Every operator who is conscientious in his service to his patients attempts to remove all tartar and food materials from the surfaces of the teeth and gums of every patient, but this service, commendable as it may be, is not prophylaxis. It is more properly known as "cleaning teeth." True prophylaxis involves the preparation of the dental tissues so that they may be continuously kept relatively clean. The large majority of mouths as we see them in dental practice cannot be properly cared for by the patient after a single cleaning, as deposits immediately begin to form which tend to produce caries and peridental irritation. It is then necessary to supplement the cleaning measures by smoothing and polishing procedures that will render the surfaces of the teeth capable of being cleansed by the personal efforts of the patient. By the use of fine files or planing instruments the roughened tooth surfaces beneath dental calculi, and those gingival and approximal areas which have been roughened by fermentation or calculi formation, may be smoothed and given homogeneous surfaces. These and other roughened surfaces of the teeth and fillings may then be polished with fine abrasive and polishing powders, using the porte-polishers, Young's engine cups, and the wide dental tape. The effect of such prophylactic measures when carried out in a thorough manner and combined with other oral hygienic measures is that the gum tissues are relieved of irritation, the teeth are rid of caries-producing plaques, and continuous oral hygiene is made possible.

IMPORTANCE OF THE PATIENT'S CO-OPERATION.

In many instances the simple reorganization of the mouth along hygienic lines is sufficient to produce a permanent improvement in the conditions. But the great majority of mouths at their best are not self-cleansing, and need the daily assistance and co-operation of the individual to attain oral health; it should therefore be the rule that the enthusiastic co-operation of the patient be enlisted in a daily care of the mouth that is most rigorous and thorough. By the use of suitable dentifrices and brushes of a hard, stiff type, with a stroke beginning high up on the gums and sweeping lengthwise the teeth, the circulation of soft tissues is stimulated and the teeth are cleansed of débris on both their lingual and labial surfaces. This must be supplemented by a cleansing of the approximal surfaces of the teeth, those most susceptible to caries, by the careful use of the wide dental floss. If this can be well accomplished once a day, and in addition a light brushing be given after each meal, a continuous state of mouth cleanliness will usually be maintained. With regard to the selection of dentifrices, certain mouths seem to need a preparation having a slight abrasive action, while others may be well cared for with those containing only the finest grades of calcium carbonate. We have published a short description of a number of the common varieties in the *Journal of the National Dental Association,* for August 1915, to which those who desire this information are referred.

For the best results in this form of endeavor it is highly desirable that such patients be seen occasionally, some more frequently than others, for the purpose of assisting them in the care of their mouths and for the detection of dental diseases at their inception.

THOROUGH MASTICATION AN IMPORTANT AID TO ORAL HYGIENE.

It must also be remembered that one of the greatest aids to mouth cleanliness is the habit of thorough and vigorous mastication of hard foods, by which the teeth are mechanically scrubbed in a natural manner, a copious flow of saliva is induced by which the mouth is cleansed, and the gums and peridental tissues are massaged. This action may be intensified by the chewing of tough gums, such as spruce gum, directly after each meal.

To many general practitioners the procedures as outlined may seem complicated and impracticable of accomplishment in everyday dental service. This, indeed, might be true were they all adopted at once, but the object of the writer is to present an ideal which may be the *motif* of general practice to which all operations may be made to conform as nearly as possible. Nor is the ideal impossible, for we may point to a goodly number of general practitioners who for many years have been successfully putting these principles into effect in a large percentage of their cases. They have proved that preventive dentistry is possible and practicable in general practice. It only remains for the mass of dental practitioners to adopt these measures and this ideal, to make dental prevention a reality. No one can truly appreciate the benefits to be derived from such methods of practice by hearing them described, or even by seeing the results of others. They can only be realized by personal application of such principles and by personal observation of the resultant changes in the oral conditions. Thus it is that those who doubt are convinced; and only those who will not see, disagree. One cardinal characteristic is demanded, and that is thoroughness. Halfway measures will not accomplish prevention, but the complete fulfilment of our present known methods of oral hygiene not only prevents dental disease but is of direct benefit to the body as a whole. Let us, then, rise to meet the situation; let us practice to the best of our ability the methods of prevention which we now know, and widen the scope of such service until it shall reach all people, to the end that we may most effectively perform our part in the great work of preventive medicine of today.

916 CHURCH ST.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

The Present Standing of Electrolytic Medication, with a Discussion of a Few Basal Principles Therein Applied.

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IN view of the numerous testimonials which so favorably refer to the gratifying results of ionic medication by means of the galvanic current, it is almost impossible to account for the general hesitancy on the part of the dental profession to welcome this phase of the healing art. For this attitude we may probably assign both subjective and objective causes. If a knowledge of all the fundamentals of the theories involved in electrolytic medication were necessary as a prerequisite, the generality of the profession could not adopt this mode of medication; hence the prevailing hesitancy—and with sufficient reason, because not only college men, but even university professors making this study their life-work would be overtaxed in the effort to grasp the subject in its entirety.

The above assertion may be safely granted, when we consider the introduction of the ionization theory, which was so reluctantly accepted at first, and when we add to this that the ionization theory itself postulates other theories which were looked upon with equal suspicion, chief among which is that of osmotic pressure. Briefly, complete mastery would require a thorough knowledge of physical chemistry, as reconstructed upon the discovery of Arrhenius (1889) and comprising the valuable work of Faraday, Pfeffer, Van 't Hoff, Hittorf, Kohlrausch, and others. In addition to this, the practitioner should possess a working knowledge of the physics of electricity, and a rational conception of the pharmacological action of the ions of the electrolytes which he would employ as his remedial agents—*i.e.* a clear conception of drugs in the sense outlined by Krönig, Paul, and a few others.

MISCONCEPTION WITH REGARD TO IONIZATION.

While the insufficiency of information thus outlined may be the main deterrent, we believe we err but little in claiming that the dentist is objectively barred to a certain extent by the lack of proper literature—more correctly, perhaps, by the lack of a succinct and at the same time sufficiently complete and accurate exposition of the subject. The writer is impelled to this statement by the prevalent misconception that "Ionization is a production of the current." When we try to ascertain the general understanding of "ionization" in the profession, we find that it is most commonly confounded with what we properly term "electrolysis." Where this misconception does not obtain from personal impression, it is casually gleaned from extant literature upon the subject, as is evidenced by the following quotations:

> An example of the movements of ions is furnished when the current is passed through a solution of zinc chlorid between two poles, and $ZnCl_2$ is split or dissociated into the cation Zn, which becomes positively charged and moves toward the negative pole, and the anion Cl_2, which becomes negatively charged and moves toward the positive pole. [Prinz-Sturridge(1).]

> The ion itself may be an invisible product of electrolysis. [Sturridge(2).]

The passing of a galvanic current through the body is regarded as productive of ions. [*Ibid.*]

This is what is known now as ions of the metals which are dissolved by the action of the current. [*Ibid.*]

Good results were invariably obtained with simple salts from which ions of an antiseptic nature were readily formed by a low current strength. [*Ibid.*]

All substances are not dissociated by the effect of the current. [*Ibid.*]

From these introductory remarks, it appears that the question of so-called ionic medication assumes a status which, while deplorable, is not altogether inexcusable. The reader will doubtless agree with the writer that some remedial impetus is wanting, which, if effectively introduced, would soon banish all the lack of attention to this phase of medication among American dentists. It is no secret that a number of dentists in several parts of our country are working in this direction, but have never given publicity to their individual efforts and successes. What an advancement would be accomplished if these individual workers were to meet in convention to discuss basal principles, to fix the terminology, and to adopt such standards of procedure as would result in a perfect and reliable technique! A prompt response upon the part of the profession could scarcely be doubted, since the American dentist is quite alert to professional betterment and neglects no personal effort in its attainment. A united effort on the plan thus proposed to bring electrolytic medication into prominence in America would be a realization of a fond hope, but the writer desires to present, in the sequel, his views regarding a few theoretical principles as applied in the present standing of the science.

NOMENCLATURE.

And first, as to the name of that branch of medical treatment which we effect by means of the galvanic current, and which at present is called "ionic medication:" Is the name appropriate? Conventionally it has come to assume that meaning, but, in strictness, it does not express the essence of the process. The writer would suggest that the term "electrolytic" be substituted for that of "ionic," for reasons which are too apparent to be passed by. We have ionic medication in the absence of all electric current when, for instance, we seal zinc chlorid in the root of a tooth for antiseptic purposes. We know that the dissociated zinc (*i.e.* the zinc ion) of the compound possesses the antiseptic property primarily, and not the dissociated chlorin, for, otherwise, any indefinite chlorid could be employed. If, then, the zinc ion sterilizes the root-canal specifically, in as far as it is in the ionic condition, we certainly have ionic medication, although we never applied the current. Consequently, we include in the term "ionic medication" more than we really express.

Dr. Tousey(3) avoids this difficulty by using the expression, "ionic medication by electrolysis." In selecting the term "electrolytic" we introduce nothing new, but simply employ the nomenclature of Faraday (1835), the discoverer of the *laws of electro-chemical change,* who called the process of conduction of electricity by an electrolyte by the name *electrolysis*(4). Now, since the medication under discussion depends primarily on the movement of particles (the ions) of ponderable matter, and this movement is essentially the conduction of electricity, it is apparent that no better name could possibly be employed than the term "electrolytic."

The several citations given in our introductory bear sufficient evidence that production of ions by the electric current is an accepted fact, even in current literature. While among the misinformed the impression is that ionization straightway results by the passage of the current, the authors of the above quotations have a clear conception of ionization apart from the electric current, and indeed in the true sense of the electrolytic dissociation theory; but they simply maintain that ions, either alone or in addition to ions present from the electrolyte employed, can be formed from what they call the sensitive, soluble, or oxidizable electrodes, by the passage of the galvanic current. In other words, they hold that *an immediate production of ions by the current* is possible. Sinclair Tousey under the heading, "Distinction between electric ionic medication and other ionic medication," gives expression to the above conviction in the following terms:

> Dissolving any substance produces a certain number of ions of that substance, and it is probable that all medication depends chiefly upon these active particles of the different substances. Electric ionic medication is the production of ions and their introduction into the body by means of an electric current.

HOW IONS ARE PRODUCED.

Now, the claim that ions are formed by the current must be founded upon some phenomenon. If the explanation of the phenomenon is misleading, we simply have a case of a misconception of the phenomenon. The phenomenon whereby the production of ions by the current is explained in the above sense is commonly exhibited by the following interesting experiment: Elementary—or free—iron is employed as the anode, which sends off ferrous ions into the surrounding moist or liquid medium. Now, as we know from analytical chemistry, ferrous ions in the presence of potassium ferricyanid (which, of course, is mixed with the medium) produces the characteristic blue, which naturally stains the medium in question. If metallic copper be used as the anode, cupric ions will be given off; these have a color of their own and would stain the surrounding medium a light-green. Sturridge(5) in his experiment employs both metals and uses moist albumin as the surrounding medium. That certain ions appear, and that they come from the substance of the electrodes (anodes) employed, and that they are introduced into the body of the albumin by the electric current, cannot be denied. But all these circumstances do not demonstrate that they (the ions) are produced by the current.

At this point we must not fail to cite one authority who does not accord with the above view, namely, Lewis Jones(6), who also performs the above experiment, but uses, instead of albumin, moistened parchment paper folded to a thickness of eighteen layers. This authority explains the phenomenon in question as a secondary reaction, as can be best shown in his own words:

> Another form of secondary reaction is a reaction in which the metal of the anode is concerned. If the anode is a metal such as zinc or copper, which can readily form ions, and if the electrolyte be one containing anions such as Cl or SO_4, which can combine with zinc or copper to form compounds such as $ZnCl_2$, or $CuSO_4$, then the SO_4 combines with the zinc or copper instead of combining with the hydrogen of the solvent, and the metal of the anode goes into solution and hydrogen is not liberated. Zinc or copper ions will move away from the anode, and when either of these metals is used as the anode in an application to a patient, then a salt of the metal will migrate into the moist fabric which lies between the metal and the skin, and will eventually enter the skin and tissues of the patient. If copper were the metal used, the fabric would be stained greenish by the penetration of the cupric ions. If iron were used instead of copper, the fabric would be stained with iron-mold.

Jones' description, while it does not consider the current as a causative factor directly, nevertheless fails to account for the appearance of the iron and copper ions. What, then, is the real cause of the appearance of these ions? We may now give as our positive answer, that the ions in question are due to the *electrolytic solution pressure* of the metals, and in the case of the experiments above, to that of the iron and copper. For this solution of the problem we are indebted to Professor Nernst,(7) who did not primarily introduce the electrolytic solution pressure to account for the presence of ions, but rather for the establishment of the source of electromotive force. With the ratio of the electrolytic solution pressure (P) to the osmotic pressure (p) of the solution (the moist medium of the above experiment), Nernst was enabled to develop his famous mathematical formula to express the value of electromotive force (E):

$$E = 0.029 \log \frac{P}{p} \text{ volts in the case of a bivalent metal,}$$

$$\text{or } E = \frac{0.058}{n} \log \frac{P}{p} \text{ volts, in which } n \text{ stands for the valence of the metal.}$$

The scope of this article forbids saying more about the electrolytic solution pressure. For our purpose, it is sufficient to have disproved the statement that the ions in question are produced by the electric current. (Let us briefly note in passing that these very ions appearing around the anode are an indication of an electromotive force which acts counter to the source of the current, and which is known as polarization—which we shall touch upon again.)

Aside from the misconception of ionization by the current, there is another misuse of the term "ionization" (or "to ionize") to express the action or effect of ions upon the various tissues which we wish to treat. This misuse is apparent from the following quotations:

> The therapeutic effect of the ions . . . . must be determined in the selection of the drug for ionization. . . . . Ionization with anions. [Prinz–Sturridge.]
>
> Needles of zinc and copper are also used sometimes to pierce the part to be ionized. . . . . Caré has described the following method for preparing sounds for the ionization of fistula, urethrites, etc. [L. Jones.]
>
> Zinc ionization for epithelioma. . . . Salicylic ionization in acute rheumatism. . . . Lithium ionization in gout. [Tousey.]
>
> Copper electrodes are often used by the author for the ionization of fistulous tracts. . . . . The effect is, in case of ionization with an antiseptic ion . . . . [Sturridge.]

Now we all understand that neither the purpose nor the intention exists to ionize (or convert into ions) the tissues in question, since all that concerns us is the therapeutic effect of the ions of our drugs. According to the foregoing, such an expression as "ionization apparatus" would be very inappropriate.

ELECTROLYTIC MEDICATION.

It being understood that electrolytic medication consists essentially in the application of drugs which in the ionic form are carried into the tissues by a continuous electric current, the question may now be asked, What particular phase of the physics of electricity should chiefly occupy the practitioner's attention? This particular phase is the exceedingly important question of *electrical energy,* without a real conception of which, electrolytic medication can never stand out as a true science. We must conceive electricity as an *energy,* as we do heat, light, work, etc., if we would understand the essence of electrical phenomena. The failure in our current literature to consider electricity as an energy is probably the chief cause of the discrepancy among our authorities on the point of voltage or ampèrage to be employed. While each of the authorities recommends a certain suitable current, or ampèrage, they all seem to show some uncertainty as to the electromotive force to be employed, as though this were a matter of choice, to be worked out by practice. Naturally, as we know, a certain current passed through the body will, in a measure, determine the voltage, because the patient will just tolerate a certain dosage—the "pain limit," as it is called by some writers. Now, neither current, nor electromotive force, separately, constitutes electrical energy, but if we take the product of these two factors, current and electromotive force, we arrive at the definition of electrical energy. When Faraday first introduced his second law of electro-chemical change, he met with great opposition, and even Berzelius failed to correctly understand the meaning of that law, because he regarded it as stating that an *equal quantity of electrical energy* was necessary to decompose *equal chemical equivalents* of different substances. Whether or not Faraday himself had a clear conception of electrical energy, his law states concisely that an equal quantity of *electricity,* and not an equal quantity of *electrical energy,* is required to separate an equal chemically equivalent quantity of the substances. By quantity of electricity, of course, is meant the quantity of current, and Faraday's law is validly applicable without the conception of electrical energy, because the decomposition is directly proportional to the current. Of course a certain decomposition voltage is necessary, because without it no current would flow, and Faraday's law would have no purpose. Faraday's law, being particularly concerned in electrolytic work, has naturally gained prime attention, even with total neglect of the electromotive force. LeBlanc says: "The factors of an energy are still often mistaken for the energy itself." The current is only one factor of electrical energy, while the electromotive force (voltage or potential) is the other. Expressed in formula,

Electrical energy (E) = electromotive force (V) × current (C), or $E = V \times C$.

As in the case of all forms of energy, we have two factors which are designated by special names, viz, the *intensity* factor which generally determines the equilibrium in a system, and the capacity factor, which has reference to quantity. Note what Prof. Wm. Ostwald (8) says on the factors of electrical energy: "Like the other forms of energy, electrical energy appears as the product of two factors, one of which is called *quantity* of electricity, the other, *potential tension,* or *electromotive force.* The first factor is a capacity, the second an intensity, so that electrical energy can only assume a permanent, stable state when the second magnitude is the same throughout the system. When this is not the case, a change of state occurs from which work may be obtained, just as it can be got from change of state of heat or of any other form of energy. The other factor, the quantity of electricity, is usually looked upon as being the real existent *thing* that lies at the bottom of all electrical phenomena, and the whole nomenclature of electrical science has been formed in accordance with this conception. Although the view has often been found very convenient, it must still be borne in mind that the *thing* underlying electrical phenomena is *electrical energy,* and that the nomenclature usually adopted is only of value as affording us, in many cases, a means of clear and concise formulation."

Now, "the real existent *thing* that lies at the bottom of all electrical phenomena," namely, electrical energy (the product V × C) constitutes the dosage above hinted at, because it represents the actual amount of work performed upon the tissues. If this be true, then it is quite optional in which way we regulate the individual factor for the sake of serving other desirable purposes, as long as we conserve the energy. We know from Faraday's law that the greater the quantity of current (in coulombs), the greater will also be the quantity of ions which will migrate into the tissues. Consequently, by reducing the voltage we can correspondingly increase the current, with the resultant greater movement of ions, without altering the electrical energy numerically, *i.e.* without hurting the patient by overcharging. We may make the voltage as small as we choose, provided we observe the limits of the decomposition voltages of the substances around the electrodes. A numerical example may elucidate our contention. Suppose we ascertained the maximum dose of electrical energy for a certain patient as .00486 joule (1 volt-coulomb), and suppose, furthermore, we employed as our medicinal electrolyte zinc chlorid,* whose decomposition voltage is 2.18 volts ($+0.49 + -1.69 = -1.20$). (To simplify matters, we assume that the electrolyte† (*i.e.* $ZnCl_2$) is used at the so-called inactive electrode, the complex electrolyte of the body intervening being neglected, since this would not introduce any error, and since, moreover, the conception of the migration of the ions is not identical with that of their neutralization at the electrodes.) Then, by solving the above equation, $E = V \times C$, for C, and substituting, we obtain

---

* This value is taken from Alex. Smith, "Introduction to Organic Chemistry," Century Co., 1909.

† The usual saline solution, sodium chlorid, has a decomposition voltage of 4.23 volts.

$$C = \frac{E}{V} = \frac{.00486}{2.18} = .00225 \text{ ampère, or } 2.25 \text{ milliampères.}$$

Now, if we were to employ 8.72 volts—four times the voltage of the above example—we would have the following results:

$$C = \frac{E}{V} = \frac{.00486}{8.72} = .000557 \text{ ampère, or } .557 \text{ milliampère.}$$

From these two examples we learn that for the same electrical energy expended upon the patient, we obtain 2.25 milliampères in the first case, and .557 milliampère in the second, which is four times less than the first example. Again, if we were to employ zinc iodid (ZnI_2), instead of zinc chlorid—it being understood that we are here concerned with the antiseptic ion Zn, and that it is immaterial from what compound we obtain it as long as the anion does not become objectionable—we could reduce the voltage still more, because the decomposition voltage of ZnI_2 is only 1.29 volts (+ 0.49 — (—80)). Calculating the current, as above, we obtain

$$C = \frac{E}{V} = \frac{.00486}{1.29} = .0037 \text{ ampère, or } 3.7 \text{ milliampères}$$

—six times as much as in the last example. The reader will note that we have not taken any cognizance of Ohm's law in our above discussion, and if we treat the subject strictly the conception of resistance does not enter into consideration—"because," as LeBlanc says, "the quantity of energy is independent of the time, and because the resistance only determines the time required for the fall to take place." In conformity with what has just been said, an "electrolytic posology"—if the writer may thus introduce the term—could be elaborated with a complete neglect of the resistance (?) of the various parts of the body. By employing a certain voltage—say two volts—and inclosing a standard milliampère-meter in circuit with any part of the body, we could read off the current directly. We would thus have both the intensity factor (V) and the capacity factor $\left(\frac{C \text{ ma.}}{1000}\right)$ of the electrical energy impressed upon the part of the body in question. The calculation would be simple, viz:

$$V \times \frac{C \text{ in milliampères}}{1000} = E$$

While upon the question of the resistance of the body, the writer would briefly criticize the manner in which this subject is treated in our usual text-books. We should not speak of *resistance* at all. The proper designation is *conductance* (or conductivity), which is the reciprocal of the resistance. "Resistance" is used in speaking of conductors of the first class, such as the metals, while "conductance" is applied to conductors of the second class—namely, the electrolytes, of which the human body is a representative. The measurement of the conductance in reciprocal ohms $\left(\frac{1}{\text{ohm}}\right)$ of electrolytes is essentially different from that of the ohms in the conductors of the first class—for which discovery, as also for the method of measurement, we are greatly indebted to Kohlrausch. Kohlrausch (1880) introduced the alternating current in connection with the Wheatstone bridge, for measuring the conductance of electrolytes in order to avoid polarization, which is always produced with the direct current, and which gives inaccurate information. This being true, the information as given in our textbooks on the resistance of the body and the calculations derived from it must necessarily be misleading.

RESISTANCE OF THE TISSUES.

Resistance, indeed, plays an important rôle in electrical science, especially in the design of electrical apparatus, in which the heating effect, or the C^2R losses, as it is called, must be carefully considered. The heating effect, being proportional to the resistance and to the square of the current, can be maintained within certain limits by selecting a compromise between the two factors, *i.e.* by increasing or decreasing either resistance or current. Applying this consideration, however, to the tissues of the body, we are at once limited to the one alternative of varying the current, since the body resistance cannot be changed. If now, furthermore, the claim be correct which has been put forth by some writers, that the pain sensation under the electrical current is a true heat effect which is directly consequent upon the high resistance of the body tissues, then our practice has been validly established in controlling the "pain limit" by regulating the current, since the resistance in question is an invariable quantity. The logical inference which we might draw from the above consideration could be reduced to this: The body tissues can bear just a certain amount of heat, hence in order to keep within that limit we can only employ the electrical equivalent of that heat. This would be the truth if the body tissues were a real resistance—as that of conductors of the first class. We know that, in an electrical circuit where no sort of work is taken off, all electrical energy is converted into its equivalent of heat, and where work is taken off the circuit the heating effect falls off proportionately. Now, when we pass a current through the body a certain amount of electrolytic work is done by the current, and that work is not performed upon the tissues but strictly on the electrode surfaces, which are outside of the body. The movements of the ions of, or in, the body, which transport the current, require no work in the sense of energy to be expended upon them by the current, and the number only of ions present determines the quantity of electricity that will flow. Double the number of ions would transport twice the amount of current, or conversely, twice the amount of current would require twice the number of ions for its transport. This is in conformity with Faraday's first law. Now, if the last ion had been called into requisition, as it were, no further increase of current-flow could be possible—for the non-electrolytic constituent of the body is a non-conductor, and as such could not possibly transport any current, and all question of *resistance* becomes thus excluded. What, then, produces the pain of our patients under the electrical current? Might we not call it an *electrical effect?* No!—for we claimed that no work was expended upon the tissues, and besides, we have no sense perception specifically for electricity, except through its transformed energy, heat; so that the heat theory, in itself, is not incorrect. An explanation may possibly be gleaned from the works of our physical chemists who speak of "ionic friction," which is probably the cause of our pain sensation under the electrical current, not the *resistance* in the sense that it opposes the flow of electricity, as with conductors of the first class.

CONCLUSION.

In conclusion, the writer would exhort those members of the profession now practicing electrolytic medication to turn their attention to, or try out, the application by means of the galvanic current of Dr. Martin H. Fischer's(9) salt solutions in œdematous conditions about the mouth. It is not known to the writer whether or not Fischer's salt solutions have been introduced in this way. Certainly, these solutions, being specifically employed as electrolytes, could be easily introduced into the tissues by the current, especially since neither cataphoretic nor anaphoretic transport is intended, but, primarily, only that of either the positive or negative ions of the solution. The one successful and rapid means of relieving those troublesome swellings about the gums which are so vexing to the dentist and so painful to the patient would amply justify the practitioner in familiarizing himself with the principles and technique of electrolytic medication.

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425 CLARK ST.

A Study of the Minute Structure of Dentin, Especially of the Relation Between the Dentinal Tubules and Fibrils.

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(Continued from page 148.)

(II.)

V. Observations on Ground Sections of Dentin.

WHEN we make very thin ground sections of dentin, embed them in glycerin or balsam, and examine them under the microscope, employing a comparatively small diaphragm, we observe, as shown in Fig. 33, that there are some fibrilla-like bodies running longitudinally through the basis substance, and along the sides of these are white bordering layers which refract light. Also in the transverse sections, the fibrillar bodies show in the transversely cut surface, surrounded by thick and upheaved circular layers, and similarly refracting light as in the case of the longitudinal sections. (Fig. 34.)

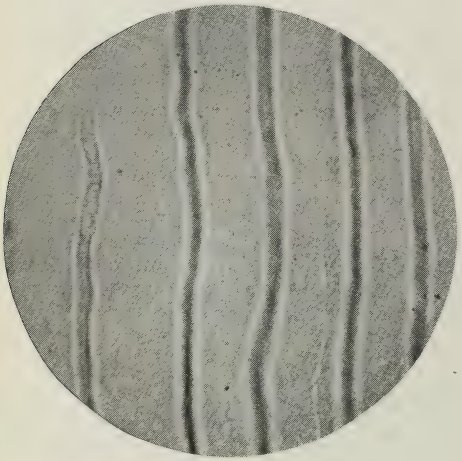
It is the opinion of Römer that in the transverse section (Fig. 34), that which is in the center is the dentinal fibril or the dentinal tubule, and that the upheaving circular layers around are portions of slightly calcified basis substance. But Fleischmann and Ebner were of the opinion that the circular layers are nothing more than a virtual image, and that the ground sections are of no service for research upon the dentinal sheaths or the dentinal fibrils.

When the longitudinally ground sections are submitted to examination after carbol-fuchsin staining the basis substance remains unstained, as a rule, while the fibrillar bodies take more or less color, and the borders present a deep red tint, showing a similar appearance to that of the dentinal fibrils in the decalcified and stained sections. In the cases in which the staining was unusually good, other stained layers are to be met with on the outer sides of the fibrillar bodies which have the bordering layers above remarked, as in Fig. 35.

Comparing the observations already mentioned to the appearances in the decalcified and stained sections, the fibrillar bodies are confirmed as being the dentinal fibrils, and the outside layers the walls of the dentinal tubules. When we examine a section with a small diaphragm which shows vividly the difference between the dentinal fibril and the wall of the dentinal tubule, we frequently observe that there is another white layer which refracts light on the outside of the wall of the dentinal tubule. This confirms the belief that the white bordering layer in the unstained section is but a virtual image. It is the same as when we examine a fiber—for instance, a hair—or bacteria not stained, employing a small-sized diaphragm, we see clearly a white and transparent layer on the outer side which refracts light.

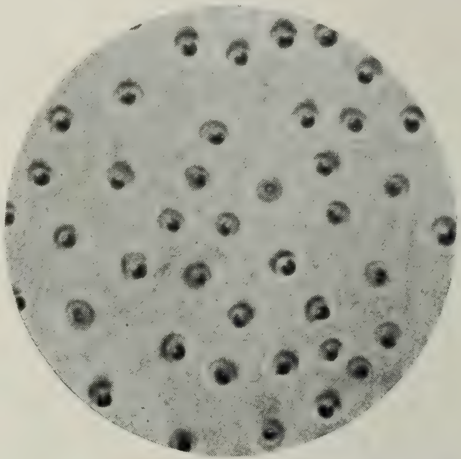
When further study is made on the transverse section which was stained with fuchsin, if the staining proves good, the dentinal fibrils appear as small red spots, and surrounding them we can observe vividly stained circles, or walls of the dentinal tubules. When we reduce the diaphragm and regulate it to the fine adjustment, we frequently see in the surrounding part of the circular walls of the dentinal tubules an apparently upheaving layer just the same as in the case of the unstained specimen.

Fig. 33.



Longitudinally ground unstained section of dentin. Magn. 1050 diam. Examined with a small diaphragm. Shows the virtual image of a brilliant white color on the outer portion of a fibrillar substance (or the dentinal tubule filled with the dentinal fibril).

Fig. 34.

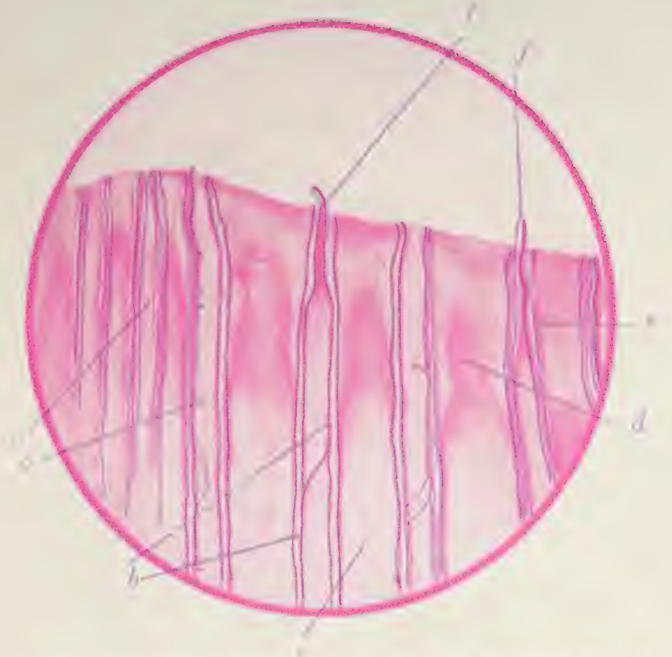


Transversely ground section of dentin, stained slightly with fuchsin. Magn. 1050 diam. Examined with a small diaphragm. Shows the virtual image just like a circle on the outer portion of the spot-like matter stained with fuchsin (*i.e.* both dentinal tubule and dentinal fibril).

According to the observation of Neumann, the so-called dentinal sheath being a completely calcified basis substance, it was believed that it could not be traced in the ground sections; but from the fact that I could stain it with fuchsin rather easily, I am inclined to explain it as a part of the uncalcified or at least imperfectly calcified basis substance.

If the dentinal fibril or the wall of

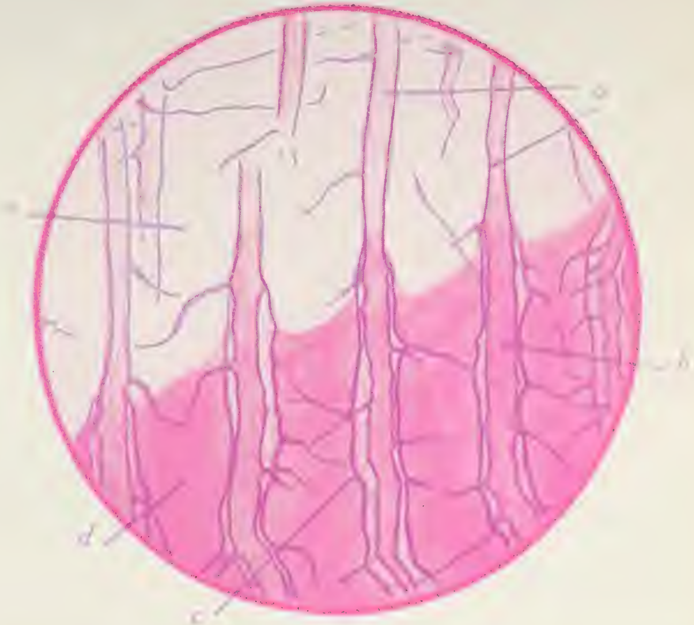
Fig. 38.



Longitudinal ground dentinal section taken from the neck of a sound first bicuspid. Shows the dentinal canals close to the pulp cavity. [illegible] Mass about [illegible] a, Dentinal fibril in which [illegible] observed. b, [illegible] layer or dentinal sheath. c, [illegible] d, Basic substance in [illegible], slightly stained with fuchsin. e, Wall of dentinal canal [illegible] with fuchsin. f, Dentinal fibril projecting [illegible]

([illegible] mm, compensation ocular [illegible])

Fig. 39.



From preparation of [illegible] longitudinal [illegible] section taken from [illegible] of a [illegible] third [illegible] [illegible] a, Dentinal fibril [illegible] Dentinal canal [illegible]

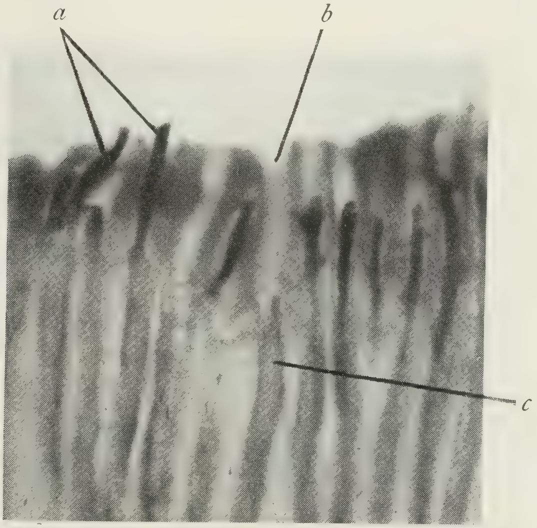
([illegible] 2 mm, compensation oc. [illegible])

the dentinal tubule is a substance in which calcification is not completely effected, it is obvious that it differs greatly from the calcified basis substance in refraction of light. Though in the case of the transverse sections the dentinal fibril presents simply a spot-like appearance, it is really of the same length as the thickness of the section, and curves more or less in a wavy manner. If we look at this fibril directly from the front, we see plainly the virtual image in the surrounding part of the fibril. Further evidence may be adduced from the fact that the transparent layer in question is seen to be different in size or rising higher than the surface of the section, or becoming concave with a circular appearance, in accordance with one's voluntary movement of the fine adjustment. Furthermore, when we examine the section with the diaphragm extremely reduced we see two or three more circular layers around the circular layer in question. This proves that the layer is nothing but the virtual image brought out from the refraction of light.

We have already noted the fact that we could recognize the difference between the dentinal fibril and the dentinal tubule, as well as the virtual image caused by refraction of light in the ground and fuchsin-stained sections. We always noticed a variation of appearance in the ground and stained sections, from the decalcified and stained sections, in the appearance of which there is almost no variation. We shall now note the important appearances of the dentinal tissues in the longitudinally ground sections.

(1) In the case which may be considered the standard one, we can trace the difference between the wall of the dentinal tubule and the dentinal fibril lying in the tubule, as in the decalcified and stained sections, but the transparent layer between the two is in comparison, not broad. In other words, the dentinal tubule is smaller, as a rule, in the ground section than in the decalcified one.

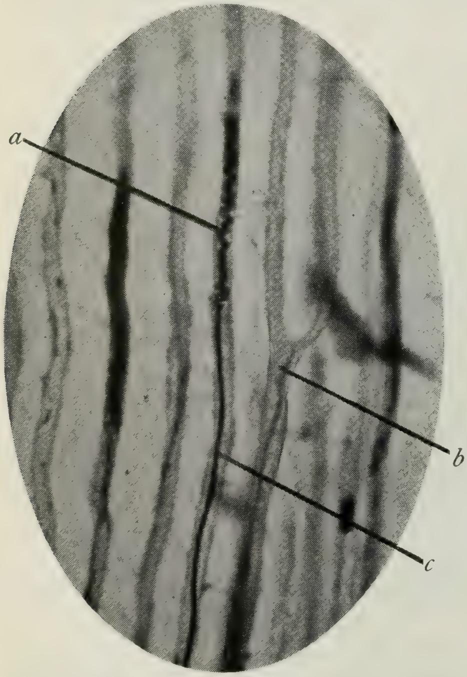
FIG. 36.



Longitudinally ground section of dentin at the part close to the pulp cavity. Fuchsin staining, after the water bath. Magn. 1050 times. *a*, Dentinal fibrils, stained deeply with fuchsin, which show the solid appearances. *b*, Hollow dentinal tubule caused by the absence of the dentinal fibril fallen away. *c*, The portion of the dentinal fibril fills the dentinal tubule.

(2) We do not see, in most cases, the difference between the dentinal tubule and the dentinal fibril, so much as in the former instance, either in the dentin near the surface of the tooth (or dentin close to enamel), or in the dentin at the root, but observe simply a fibrillar substance stained with fuchsin which possesses two parallel bordering layers and puts forth many branches around itself. Then we have to face some questions with regard to the nature of this fibrillar substance, *i.e.* whether to recognize the substance as a simple fibril, or as the combination of the wall of the dentinal tubule and the bordering layer of the dentinal fibril as the dentinal fibril fills up the dentinal tubule. We would only notice the fact that we could discern in some cases the process of the combination of the two, previously mentioned, in accordance with a certain inter-relation, when we were studying a section in which the dentinal tubule and the dentinal fibril were vividly distinguished.

Fig. 37.



Longitudinally ground dentinal section. Carbol-fuchsin staining. Magn. 1050 diam. *a*, Spiral dentinal fibril in dentinal tubule. *b*, Portion at dentinal tubule from which branches similar to tubule in size are given off. *c*, Wavy dentinal fibril in dentinal tubule.

(3) The dentin close to the pulp cavity is usually stained more deeply with fuchsin than the portion near the surface of the tooth. When we examine the former, we see, as shown in Fig. 36, that the dentinal fibril presents the appearance of a solid substance stained deeply in the dentinal tubule. Sometimes it is clearly in a spiral condition. The dentinal fibrils in Fig. 37 present wavy or spiral appearances, though they lie comparatively far from the pulp cavity.

(4) We observe sometimes that in one dentinal tubule a part is filled with the dentinal fibril, and a part is seen with comparatively large transparent places between the tubules and fibrils, while in another case the tubule would contain solid fibrils and we see distinctly in this case the wall of the dentinal tubule; but this is not always the case, the relation between them being sometimes quite indistinct.

(5) In the process of grinding down, the dentinal fibril extends out occasionally for a certain length, projecting quite freely from the dentinal tubule. In another case a long dentinal fibril may become detached and project at the fractured edge, being accidentally extruded. (See Fig. 52.)

(6) Various appearances in the examination of the dentinal fibril will be observed which are supposed to be due to accidental destruction while grinding down the section. For instance, we observe a deep red granular substance or an extremely small spiral structure in the dentinal tubule, or sometimes, as the dentinal fibril is apt to become detached more or less from the dentinal tubule, the prominent edge of the fibril presents a distinctly red tint, and has the same appearance as a quite small solid dentinal fibril. Again, it appears in some cases as an irregular fibril stained deeply with fuchsin.

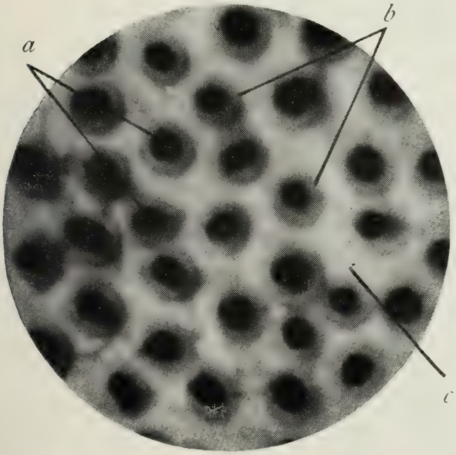
Secondly, I wish to make a note with

regard to the examination of the transversely ground sections, as follows:

(1) The most pronounced appearances that we see in the transverse sections are simply many red-stained spots in the colorless basis substance. From this we cannot easily ascertain their nature—whether it is the simple dentinal fibril or the dentinal tubule containing the dentinal fibril. By reducing the diaphragm we see a circular layer around the fibrillar substance which refracts light, this being the same condition as noted before.

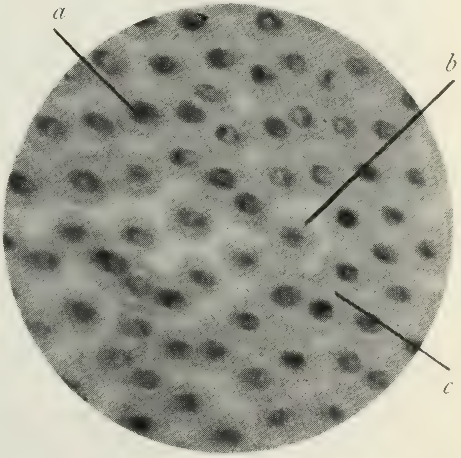
(2) After the method described in the chapter on Technique *"b"* we treated the ground section with fuchsin staining, adopting the water bath, and observed frequently circular layers which present a somewhat pinkish tint around a deeply stained red disk-like substance, as shown in Fig. 38. Comparing this with Fig. 34, it seems that the circular layer in question is positively the same as that which was recognized as the virtual image previously noted. On the other hand, as it presents a pinkish tint from the pigment, this layer may be believed to be solid and at least slightly calcified basis substance, as held by Römer and some other histologists. Walkhoff declared the possibility of staining this layer by means of fuchsin, and compared this to the transparent layer between the dentinal tubule and the dentinal fibril observed in the decalcified sections. From my experience, however, this layer is not anything existing originally, but is probably a virtual image caused by certain optical relations, similar to that described in the case of unstained sections. For the reason that the voluntary accommodation of the fine adjustment changes the appearance of the layer in size, and especially when the focus is fixed directly in front of the object, there would remain only a deeply red disk, the circular layer disappearing completely. If the circular layer be an actual substance stained with fuchsin, it should appear much more clearly when the object is brought directly into focus. As a fact, this is not the case; Fig. 39 shows that observation

FIG. 38.



Transverse section of dentin at the tooth crown. Carbol-fuchsin staining after a water bath. Magn. 1800 diam. *a*, Deeply red disk-shaped substance, regarded as dentinal tubule and dentinal fibril. *b*, Circular virtual image displayed around the disk-shaped substance. *c*, Basis substance.

FIG. 39.



Transversely ground section of dentin. Fuchsin staining. Magn. 1050 diam. *a*, Difference between dentinal tubule and dentinal fibril is unrecognizable. *b*, Virtual image. *c*, Same, apparently showing combination of the various layers.

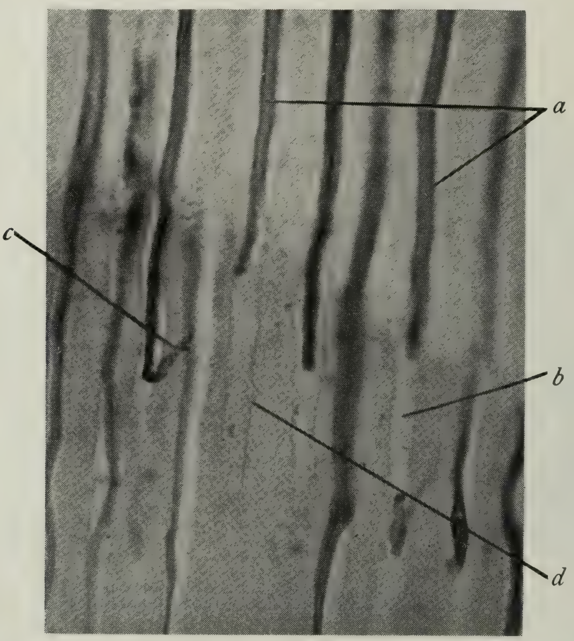
of this layer is quite uncertain. Perhaps this may have been caused by the pigment which was applied to the surface of the section and not washed off during the preparation of the sections. Furthermore, the fact that we cannot observe anything that corresponds to the peculiar red circular layer, such as is seen in the transverse section, proves that this layer does not really exist.

(3) On examining a transverse section which shows clearly the difference between the dentinal fibrils and the dentinal sheaths, we observe the dentinal fibril to be a solid substance, as a rule. This seems caused by the rough edge left on the dentinal fibril, these sections probably having been cut with a knife. However, we frequently see the tubular appearance of the fibril as a matter of course.

(4) Sometimes also in the transverse sections, as in the longitudinal sections, long pieces of the dentinal fibrils project out of the dentinal tubules, being stained with fuchsin. This is very strong evidence that we can discriminate the difference between the dentinal fibril and the dentinal tubule in the ground sections.

To sum up the results of the researches upon the ground sections already described, we may discriminate somewhat clearly the difference between the dentinal fibrils and the dentinal tubules, but they are not distinctly observed as in the decalcified sections. Furthermore, in the ground sections we

FIG. 41.

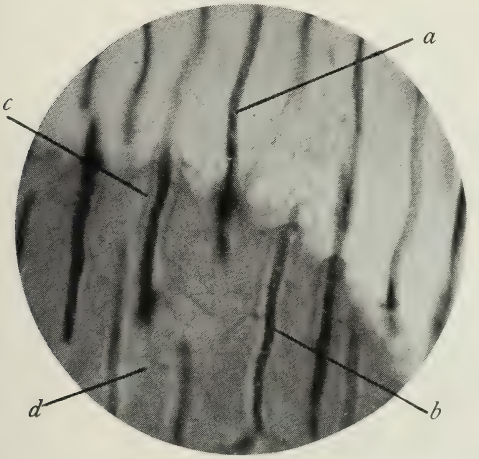


Joint preparation of both longitudinally ground and decalcified sections. Carbol-fuchsin staining. Upper part not affected by the acid action, while lower part is affected. Magn. 1050 diam. *a*, Difference between dentinal fibril and dentinal tubule indistinct. Around this substance a virtual image is recognized. *b*, Hollow dentinal tubule from which dentinal fibril has fallen off. Wall of tubule stains with fuchsin distinctly. *c*, Dentinal fibril curve after removal from dentinal tubule. *d*, Wall of dentinal tubule.

see various dubious appearances, which may mislead us, as they are affected by different refractions of light. For these reasons it is probably impossible to ascertain the relation between the so-called dentinal tubule and the dentinal fibril by study of ground sections alone.

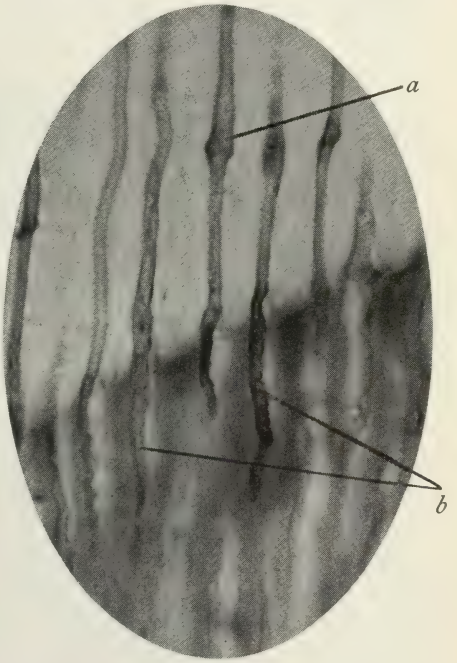
And now there remains a more important question which we must take into our consideration; that is, that remarkable differences are observed between the appearances of the ground sections and those of the decalcified ones. For instance, though we can always notice the dentinal tubule and the dentinal fibril which is contained in the former in the examination of the decalcified sections from the dentinal portion near the surface of the neck of the tooth, yet in the ground sections we can only trace a red substance which is supposed to be the dentinal fibril. Supposing this red substance to be the dentinal tubule and fibril (or dentinal tubule filled with the fibril), it is too small to be compared with those in the decalcified sections. Otherwise, if we suppose this to be the dentinal fibril alone, then the state of existence of the dentinal tubule would be too dubious and obscure for explanation. Someone would claim that, as the dentinal sheath is calcified as much as the basis substance, as held by Neumann or Fleischmann, and therefore not affected by any pigmentation, we are not able to perceive it.

Fig. 42.



Joint preparation of both longitudinally ground and decalcified sections of dentin. Fuchsin staining. Upper part not affected by the acid action, while the lower is affected. Magn. 1050 diam. *a*, Dentinal fibril; wall of dentinal tubule not recognized. *b*, Dentinal fibril; wall of tubule distinctly recognized. *c*, Wall of dentinal tubule; branch is distinctly recognized. *d*, red-stained basis substance.

Fig. 43.



Joint preparation of longitudinally ground and decalcified sections of dentin. Fuchsin staining. Upper part not affected by the acid action, basis substance remaining unstained; lower part affected, basis substance stained red. Magn. 1050 diam. *a*, Dentinal fibril; a tubercular swelling observable. *b*, Dentinal fibril showing saw-edge margin resulting from acid action.

With these various opinions before me I was for a long time unable to reach any reasonable conclusion, until I succeeded in inventing a joint preparation of decalcified and ground sections as explained in detail under method *"d"* of the chapter on Technique, which solved the difficulties. The results of the researches by this method will now be presented.

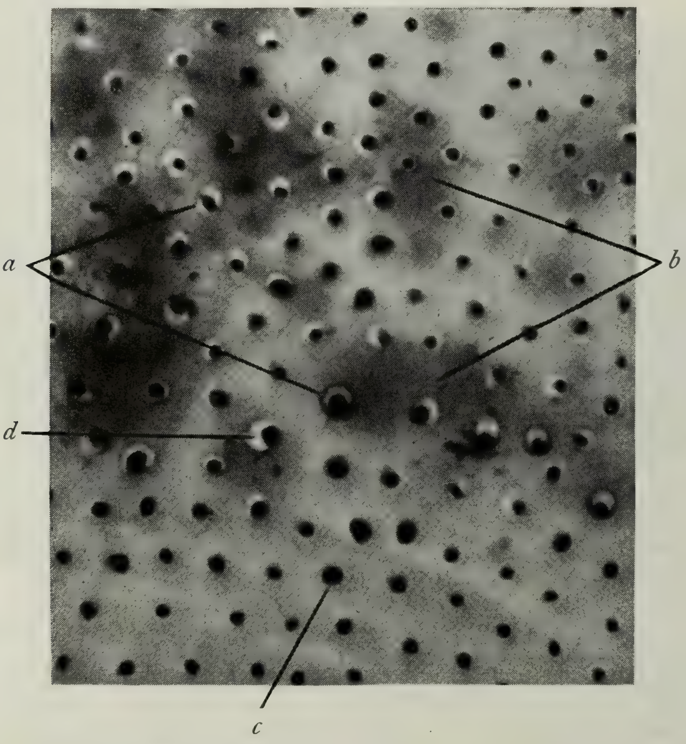
VI. Observations on Sections Prepared by the Combined Method of Grinding and Decalcification.

The observations on the ground sections differ from those on the decalcified ones, as described in the preceding division. To avoid this difficulty it is desirable to prepare the ground section first by staining with hematoxylin and examining it as we do the decalcified sections, and then decalcifying and staining it again with hematoxylin, so as to compare the results of both processes and study the changes which take place under this treatment. This method, however, fails to attain the ideal result in the ground section, for the following reasons:

(1) Delafield's or Böhmer's hematoxylin will precipitate on the cut edge of the section and hinder pigmentation.

(2) With the long treatment in Ehrlich's hematoxylin, the ground section will stain nicely, but the glacial acetic acid in the pigment will have the effect of giving the section the same appearance as the decalcified section.

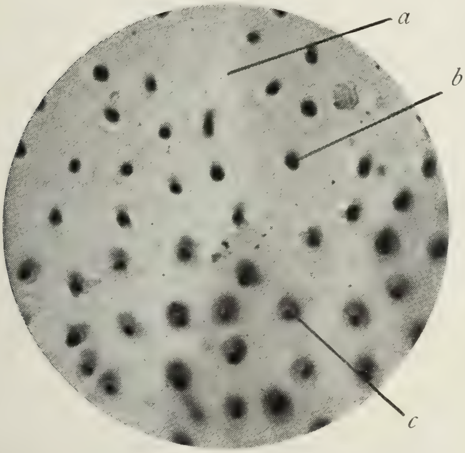
Fig. 44.



Joint preparation of both transversely ground and decalcified sections of dentin. Fuchsin staining. Upper part unevenly affected by acid, while lower part is unaffected. Magn. 1050 diam. *a*, Dentinal tubule containing dentinal fibril; wall of tubule stains distinctly red. *b*, Basis substance stained red with fuchsin under the influence of the acid. *c*, Dentinal fibril and dentinal tubule, difference between them not being perceived. *d*, Transparent layer or interstice created between dentinal fibril and dentinal tubule.

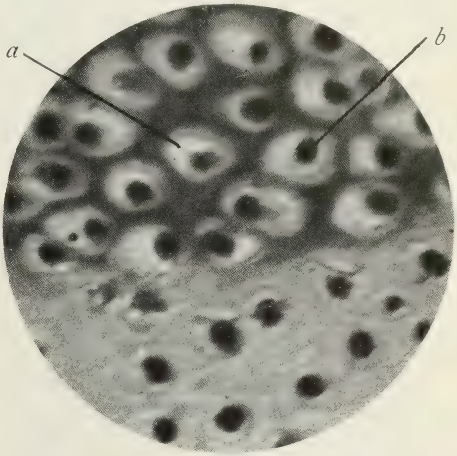
Abandoning this method for the above reasons, I secured first a fuchsin-stained ground section by the method *"d"* in the chapter on Technique, and compared the methods of staining one half of a section with hematoxylin after decalcification; secondly, I undertook the joint preparation of the decalcified and ground sections, employing the paraffin embedding method, one half being stained with fuchsin and the other half, which had been decalcified, being stained with hematoxylin, and thirdly, I stained both portions with fuchsin to compare them under examination. Of these methods the joint preparation of the decalcified and ground section is literally ideal for the purpose of studying the relation between the dentinal fibrils and tubules. I shall now describe each result of my researches on sections prepared by this newly devised method. (See Figs. 40–46.)

FIG. 45.



Joint preparation of transversely ground and decalcified sections of dentin. Fuchsin staining. Upper part affected by acid action, while lower part is unaffected. Magn. 1050 diam. *a*, Hollow dentinal tubule from which dentinal fibril has fallen off. *b*, Dentinal fibril; wall of dentinal tubule being distinctly recognized. *c*, Dentinal fibril, accompanied with a prominent-appearing virtual image. No difference between dentinal tubule and dentinal fibril is distinctly observable.

FIG. 46.



Joint preparation of transversely ground and decalcified sections of dentin. Fuchsin staining. Upper part affected by the acid action, so that the dentinal tubule expands extremely, while lower part is unaffected, and no difference between dentinal tubule and dentinal fibril is distinctly observable. Magn. 1800 diam. *a*, Transparent layer around the dentinal fibril (*i.e.* an interstice created by the expansion of the dentinal tubule). *b*, Dentinal fibril.

(1) Fig. 40 illustrates the joint preparation of the fuchsin-stained ground section and the decalcified section. The upper half shows the portion which is not affected by the action of the acid, and the other half the portion which sustained acid action. In the upper half we see a fibrillar substance (*a*) which passes through the unstained ground substance, and presenting a pink color, the bordering layer staining somewhat strongly. This is the substance that was too dubious in its nature in the ground section, as stated in the former chapter, to be recognized as the dentinal fibril or the dentinal sheath. Now comparing this to the lower half which sustained the acid action, we can see clearly a deep red layer, which is supposed to be the so-called wall of the dentinal tubule, in the surrounding portion of the fibrillar

substance in question, to the red-stained basis substance; and furthermore, we are able to see a transparent layer between this deep red layer and the dentinal fibril lying in the center of the tubule. To judge from appearances, the fibrillar substance in the upper ground section is confirmed to be both the dentinal tubule and the dentinal fibril.

(2) As is shown in Fig. 40, the border between the two portions, the one which sustained the acid action and the other unaffected by the acid, never forms a straight line, but is somewhat curved. In other words, red basis substance in the lower half seems projecting more or less into the upper part of the preparation along both sides of the dentinal tubule. This is perhaps because of the permeation of the acid, making its way chiefly along the dentinal tubule.

(3) Though the basis substance does not take stains in the ground sections, it is stained readily by the action of the acid. On the contrary, the staining of the dentinal fibril appears positively without change in any case.

(4) The dentinal fibril is seen to be the same size in both the ground section and the decalcified one. Sometimes we even observe its probable expansion. Fleischmann thought that the dentinal fibril filled the dentinal tubule in the living tissue, and was contracted by the action of reagents while the specimen was being prepared. Kantorowicz held that the bordering layer of the dentinal fibril is apparent only—that the part which turned denser due to the contraction of protoplasm took too much pigment; but this is not a correct supposition.

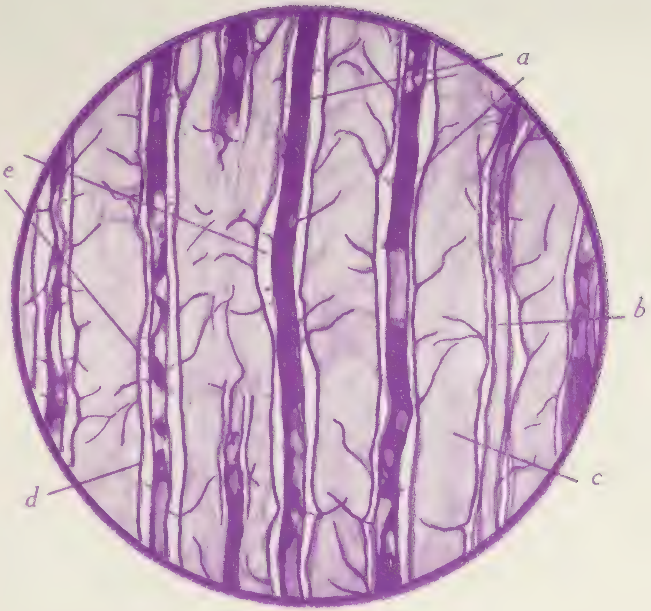
(5) With the active action of acid, very clearly transparent layers appear around the dentinal fibrils which are seen indistinctly in the ground sections. Fleischmann considered this layer as an interstice caused by the contraction of the dentinal fibril; but this opinion is not supported by fact, as the dentinal fibril does not contract at all. Römer explained this transparent layer as being slightly calcified basis substance, and Walkhoff insisted that it was a peculiar dentinal sheath. When observation is made, however, on my specimens, it is obvious that this layer is brought out technically by expansion of the dentinal tubule, and did not exist originally.

(6) If the transparent layer seen between the wall of the dentinal tubule and the dentinal fibril, in the decalcified section, is caused by the expansion of the former, it is no more than an interstice, as maintained by Fleischmann and other histologists. And then the fact that the layer in question stains in stained sections, and presents a granular appearance, is inferred positively to be due to the presence of the partial remnant of the organic substance while the expansion of the dentinal tubule is taking place, and to the existence of the minute branches given off around the dentinal fibril. Furthermore, we must take into account the phenomenon caused by the refraction of light in the case of the transverse section.

(7) The circular and apparently elevated layer in the ground section, as shown in Fig. 45, or the space we observed as the virtual image positively caused by the refraction of light for the most part, appears to correspond with the clearly observed transparent layer or interstice around the dentinal fibril in the decalcified section. But this transparent interstice is more irregular and larger in size than the circular and apparently elevated layer, as seen in Fig. 46. Besides, as observed in Fig. 40, it is evident that the layer seen in the ground section does not change directly into the transparent layer observed in the decalcified section.

(8) What is the reason for the dentinal tubule's expanding by the action of acid? This may be because of the basis substance filling the dentinal tubule having lost the calcium salt which was contained in it, causing the remaining organic substance to become contracted more or less. When a ground section is placed on the object-glass and covered with a cover-glass, a solution of acid poured into it, and the specimen then warmed over an alcohol lamp, the section will contract readily and form folds.

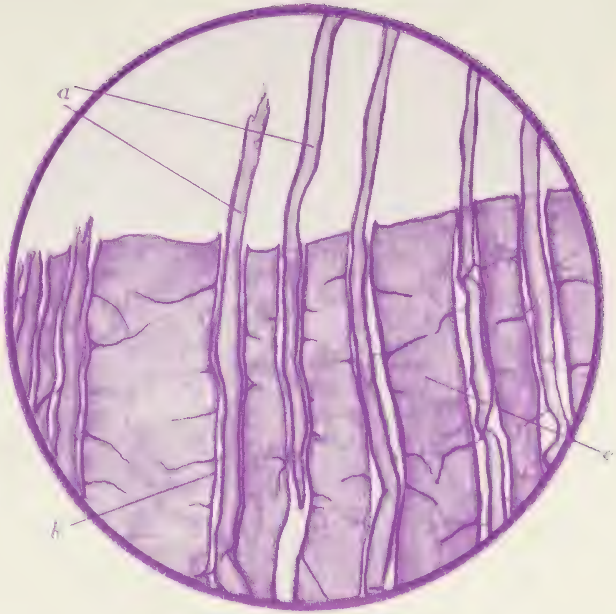
Fig. 17.



Longitudinally ground section of dentin, decalcified in diluted nitric acid after China-ink injection; hematoxylin staining (sketched). *a*. Blackened part shows China ink deposits around dentinal fibril. *b*. A part of the dentinal fibril upon which China ink does not deposit. *c*. Basis substance. *d*. Wall of dentinal tubule stained deeply with hematoxylin. *e*. Interstice newly created by action of the acid.

(Apochrom. oil imm. 2 mm., compensation oc. 12.)

Fig. 18.



Longitudinal decalcified section of dentin from root of sound first bicuspid; hematoxylin staining. Shows the dentinal fibril, broken with needles, projecting at the edge. Magn. about 1500 diam. (sketched). *a*. Long projecting dentinal fibril at broken edge. *b*. Wall of dentinal tubule, or so-called Neumann's sheath. *c*. Basis substance.

(Apochrom. oil-imm. 2 mm., compensation oc. 12.)

(9) It has been observed by many histologists that the dentinal tubule expands with the development of caries in the dentin. The first stage of this change can be explained as the resultant action of lactic acid, which is certainly the cause of dental caries, judging from the above-mentioned fact.

(10) When the expansion of the dentinal tubule is brought out by the action of acid, the dentinal fibril sometimes changes in shape, and the condition of its process becomes considerably irregular. To describe its condition more minutely, the dentinal fibril becomes saw-edged at its margin, or twisted in the tubule, or lies in a spiral state. These phenomena may be explained as follows:

In the case in which the dentinal fibril joined with the dentinal tubule in the ground section, it showed neither irregular appearance nor process; but when the ground substance softened and the dentinal tubule expanded from the action of acid, so much that interstices were formed, the dentinal fibril became curled and twisted more or less lengthwise from a peculiar elasticity which it possesses. Further, the phenomenon exhibited when the dentinal fibril detaches itself from the dentinal tubule at some portion, or when hollowness is created in the dentinal tubule due to the detachment of the fibril, is easily explained by the inference that the dentinal fibril is elastic and separates from the dentinal tubule.

(11) Fleischmann and Kantorowicz claimed that the transparent space between the dentinal tubule and the dentinal fibril is an interstice, for the reason that the process of the fibril is wavy inside the tubule in the decalcified sections. On the other hand, Walkhoff says that the wavy appearance of the dentinal fibril in the dentinal tubule is quite decidedly a virtual image. In reality, there is a transparent appearing layer, which has a uniform thickness—according to Walkhoff of almost 1.5 microns.

Later these different views will be cleared up readily by examinations of the joint preparation of sections.

VII. Observations on the China-ink-injected Sections of Dentin.

It was observed, as given in the previous chapter, under the use of the joint preparation, that the dentinal tubule expands extremely from the action of the acid. Then what is the dentinal tubule itself? What in reality exists? In other words, is the flow of the fluid going on simply through the dentinal fibril, as Römer thought? Or is it carried out through an interstice which probably exists between the dentinal fibril and the dentinal tubule? Though we observe an interstice distinctly between the dentinal tubule and the dentinal fibril, as in Fig. 35, it is not necessarily present in every case. It is quite probable that this interstice is nothing but a product of the technical preparation of the section. Believing this to be the case, I contrived a method of infusing a certain material into dentin, in the following manner:

The first consideration was to determine the material which should be infused into dentin. The material to be used should be a substance capable of passing into the interstice between the dentinal tubule and the dentinal fibril, and it is also necessary that it should be an insoluble colored substance. But soluble pigment has the defect that it will soak into the dentinal tissues without any artificial pressure and will stain so extensively that every portion will be tinged. Moreover, the pigment will be destroyed the moment the section is decalcified with the acid. There should be many coloring matters that are insoluble and would not stain the dentin, and besides be resistant to the action of the acid used for decalcification.

I employed chiefly soot for this purpose. To produce soot easily, place a clean flat sheet of glass over the flame of a lamp in which oil of turpentine is contained; a good quality of soot can thus be obtained. The soot is, first, mixed with clean water in the mortar, and then with the nutrient gelatin commonly used in the bacteriological laboratory.

It is preferable to select a freshly extracted tooth (a canine tooth is best) for this examination. Take off the enamel at the crown, so that dentin may be exposed at one part of the tooth; then cut off a small portion of the apex of the root, enlarge the root-canal with a bur, and extract the pulp. Clear up the pulp cavity thoroughly with water, afterward absorbing all moisture. Mix a small quantity of gelatin, and add properly filtered solution of soot or China ink prepared as already stated. Press the tooth into a length of thick-walled, strong rubber tubing. Cover the outside of the tubing with a sheath of metal, for the purpose of preventing the expansion of the rubber. Finally, join this rubber tubing to a suitable air-pump, and subject it to about 10 atmospheres of pressure for from 12 to 24 hours.

Make a ground section from the tooth which was infused with China ink by the means described, then stain it with fuchsin and examine in the usual way.

In the ground section prepared thus it will be seen that the China ink permeates chiefly along the interstice of the dentinal fibril and the dentinal tubule, and that around the fibrillar substance stained red with fuchsin, a black matter granular in appearance is precipitated uniformly. In the part in which the China ink was thoroughly infused we simply observe many black fibrillar substances. If we make another study of this infused section after placing it in diluted nitric acid for decalcification, and staining with hematoxylin or fuchsin, and washing, we observe a transparent layer around the black fibrillar substance, and besides this a layer stained with hematoxylin or fuchsin close to the basis substance. (See Fig. 47.) This appearance is the same as that which is seen in the decalcified section in general. The black part is exemplified by the deposit of China ink around the dentinal fibril; the layer attached to the basis substance takes pigment corresponding to the wall of the dentinal tubule. We learn from the study of this section the following facts:

(1) If the transparent layer (*e* in Fig. 47) between the dentinal fibril and the wall of the dentinal tubule is an original interstice, we should necessarily observe the actual appearance of the layer which should have been filled with China ink; but it is quite obvious that this layer is the result of the influence of the acid.

(2) It may be easily seen that, as illustrated in Fig. 47, the China ink was not infused through the dentinal fibril, but passed simply along the surface of the dentinal fibril. For this reason I claim that there is an interspace between the dentinal fibril and the dentinal tubule when the tooth is alive, and that a fluid is passing through the interstice. On submitting a preparation which evidenced this fact to Dr. Römer, he confirmed my opinion.

(3) China ink is not infused evenly; for instance, some part in the section will present a remarkably black tint, while some other part shows a small quantity of ink, and in some other part still we can observe no trace of it. (See *a, b,* Fig. 47.) Judging from this fact, the interspace between the dentinal fibril and the dentinal tubule is not of the same dimension at all points.

(4) The China ink infused from the pulp cavity advances so far that we could occasionally observe it even in the dentin near the surface of the tooth or just under the enamel or cementum.

(5) When the China-ink-infused tooth was decalcified by the usual means, and a section made after embedding it in celloidin and then staining with hematoxylin, the observation thereon was the same as that which is shown in Fig. 47.

(6) When I formed a proper cavity in the dentin in the crown, and infused China ink into the part from the outer side in the direction of the pulp cavity—the opposite of the former method of infusion—the result did not differ from that of the infusion made from inside the pulp cavity.

(7) Once I tried to infuse a mixture of vermilion, or mercuric sulfid, and gelatin into the tooth, but as the vermilion presents an extremely minute granular appearance, it is not so

easily infused as China ink, consequently it is difficult to reach the deeper portion of the tooth. When a section which had been prepared by this means was decalcified and made into a stained section, and then submitted to an examination, the granular vermilion seemed to pass chiefly along the surface of the dentinal fibril, apparently in the same manner as bacteria pass through the dentinal tubules in the early stages of caries in the dentinal region.

VIII. Observations upon a Section Mechanically Isolated.

When a fresh and sound tooth is submitted to decalcification in nitric, hydrochloric, or formic acid, embedded in celloidin in the usual way, and a longitudinal section of dentin is made, afterward dissolving the celloidin off in acetone or ether, placed on a clean object-glass and broken directly across the so-called dentinal tubules, frequently we may observe many fibrillar projections at the broken edges. The following are the opinions of several histologists regarding this fact:

(1) In 1839 Müller wrote: "I have frequently observed dentinal tubules projecting on the fractured edges by tearing the section of a tooth, and the dentinal tubule is always seen straight, never curved. From this I learned that it is not flexible. To judge from this fact, the dentinal tubule is an organic substance, *i.e.* a hard and fragile substance possessing a membrane, and probably saturated with calcium salt. But it is reduced to an elastic and soft material in the case of the decalcified tooth."

(2) In 1841 Henle wrote, in the "Allgemeine Anatomie," upon the fibrillar matter projecting from the fractured edges of the dentinal section, just as Müller dealt with this matter. He believed this to be a calcified and hard dentinal tubule, capable of being changed to an elastic material under the influence of an acid. Further, he assumed that the dentinal tubule possesses an interstice, and that probably a current of fluid was going through it by means of capillary attraction. But he does not describe the relation between the dentinal tubule and the pulp.

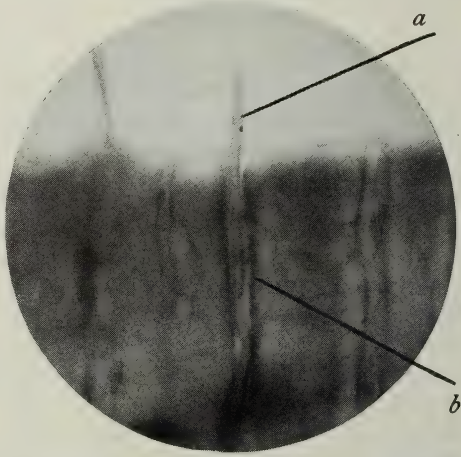
(3) In 1856 John Tomes, repeating the same examination as the former histologists, emphasized the fact that the fibrillar substance projecting from the fractured edge was a soft and uncalcified material, to be considered as the so-called "dentinal fibril." This is the very thing which we call the Tomes' fibril today. But to examine the figure drawn by himself (see Fig. 3), his observation seems still unsatisfactory, for he described only the fact that the dentinal fibril penetrates the calcified basis substance, and did not discuss the existence of the so-called dentinal sheath or its relation to the dentinal fibril. Contrary to his opinion, Boll, Neumann, Waldeyer, and Fleischmann believed that this isolated fibrillar matter was not the dentinal fibril, but insisted that it was the dentinal sheath, which is a tubular substance, and that the dentinal fibril is contained inside the sheath, the former sometimes separating and projecting from the sheath.

Walkhoff also wrote, in his "Das sensible Dentin und seine Behandlung," that the fibrillar substance projecting from a dentinal section which was decalcified and torn was the dentinal sheath, but not at all the so-called dentinal sheath which was named and delineated by Tomes. The very pale fibril projecting from the separated dentinal sheath he claimed to be the so-called "Tomes' fibril, or dentinal fibril."

To sum up the various opinions introduced so far, the opinion that the fibrillar substance separated mechanically is the dentinal tubule is accepted without any opposition by many histologists since Boll and Neumann. From my own experience, however, it is quite difficult, by tearing unstained sections on a glass mechanically, to ascertain whether or not the fibrillar substance projecting on the torn edge is the dentinal fibril, or is the dentinal sheath containing the dentinal fibril. For in unstained sections it is always very difficult to discriminate between the dentinal fibril and the dentinal tubule. Therefore, I thought it preferable to examine a stained section which showed the difference between the dentinal fibril and the dentinal tubule, and carried out an examination as follows:

Decalcifying a fresh and sound tooth, I made as thin a section as possible (less than 8 microns), removed the celloidin in a mixture of ether and alcohol, stained in Delafield's hematoxylin for from 12 to 24 hours, washed with water and dehydrated it in alcohol, rendered it transparent in carbol-xylol, tore it at right angles to the direction of the dentinal tubule with two needles, placed it on an object-glass, embedded it in balsam, and submitted it to microscopic examination. I was able thereupon to decide that (as is shown in Figs. 48, 49 and 50) the transparent layer (the dentinal sheath, as Walkhoff considered) between the wall of the dentinal tubule—deeply stained with hematoxylin to the basis substance (the "dentinal sheath," according to Fleischmann)—and the dentinal fibril is not isolated, and that the fibrillar substance projecting on the fractured edge is nothing but the dentinal fibril, the content of the dentinal tubule. Repeating this method on many tooth sections I learned that in the thick sections, those over 8 or 10 microns, it was difficult to recognize clearly the difference between the so-called wall of the dentinal tubule and the dentinal fibril, so as to become certain of the nature of the fibrillar substance projecting on the fractured edge, *i.e.* whether it was the dentinal fibril or the dentinal tubule. Further, it was noticed that, as the dentinal fibril has a tubular appearance, a superficial examination is liable to mistake the projecting fibrillar substance for the dentinal tubule. But in thin sections we can easily recognize the difference between the so-called wall of the dentinal tubule and the dentinal fibril. I observed sometimes a dentinal sheath attached to a small bit of the basis substance, projecting only a little distance from the fractured edge. This was not, however, the complete body of the dentinal tubule, but a portion of the border of the so-called dentinal sheath stained deeply with hematoxylin. In short, that which is isolated by mechanical means is the dentinal tubule or sheath. I claim that the opinion held by many histologists since Neumann is wrong. In other words, the fibrillar substance which is isolated by tearing the decalcified section is nothing but the dentinal fibril, the content of the dentinal tubule; and further, that the transparent layer which was believed to be the "dentinal sheath" by Walkhoff is a resultant production of the expanded dentinal tubule under the influence of the acid—as it is also impossible to isolate this mechanically.

Fig. 49.



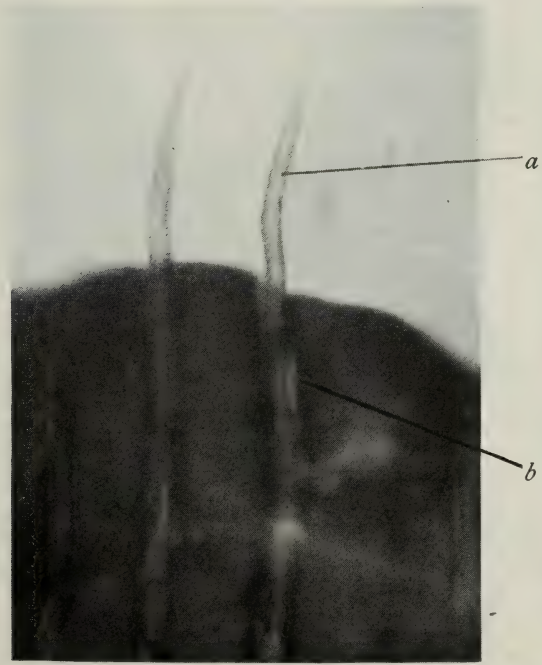
Longitudinal decalcified section of dentin, stained with hematoxylin, and then broken with needles on a slide. Magn. 1050 diam. *a*, Dentinal fibril projecting and detached from within the dentinal tubule at the broken edge, the fibril presenting a tubular appearance. *b*, Wall of the dentinal tubule deeply stained with hematoxylin.

To obtain further precise proof of the above-mentioned research, several studies were carried out, as follows:

Very thin oblique or transverse sections of dentin were prepared, stained with hematoxylin and fuchsin, made transparent in carbol-xylol, and after the difference between the dentinal fibril and the dentinal tubule was distinctly displayed, the section was mounted on the object-glass and torn with needles. We observed in every case that the so-called dentinal sheath was destroyed at the fractured edge, as is the case with the longitudinal section, and that no dentinal tubule, tubular or circular, was isolated—only the dentinal fibril, the contents of the dentinal tubule, having been isolated. Another examination was made upon a fresh tooth, which was directly ground into very thin transverse sections of dentin, and then decalcified in a 5 or 10 per cent solution of nitric or hydrochloric acid for 2 or 3 minutes, stained with hematoxylin or fuchsin, and finally torn apart on the object-glass. The result of this method was no more than simple isolation of the dentinal fibril. (See Fig. 51.)

Judging from the results above exemplified, the so-called dentinal sheath or Neumann's dentinal sheath, which is capable of deep staining by hematoxylin or fuchsin in the decalcified section, is less resistant to mechanical means of preparation, without any difference in the degree of resistance in the general basis substance, and so it is clear that this substance is too easily destroyed to be isolated by mechanical means. On the contrary, the dentinal fibril, or the content of the dentinal tubule, is considerably more flexible and resistant to mechanical means, and consequently is easily isolated from the dentinal tubule. In fact, on removing the pulp from the wall of the pulp cavity it is generally noted that many long dentinal fibrils or processes of odontoblasts are frequently isolated. The fibrillar substance, obtained by tearing the dentinal section,

Fig. 50.



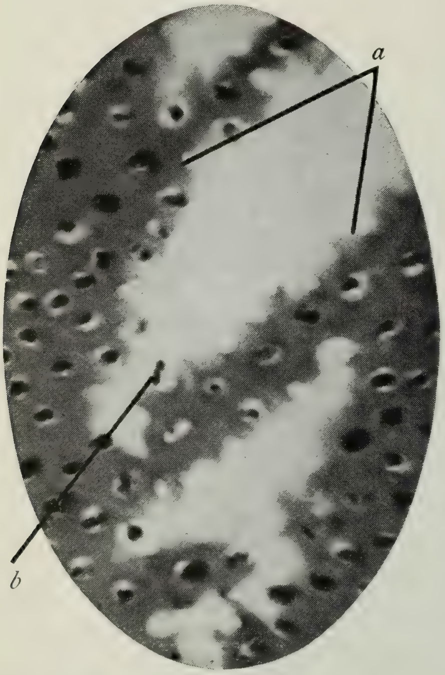
Longitudinal decalcified dentinal section, stained with hematoxylin, and broken with needles on the object-glass. Magn. 1800 diam. *a*, Dentinal fibril projecting and detached from within dentinal tubule at the broken edge. *b*, Wall of dentinal tubule stained deeply with hematoxylin.

for the same reason as given above is reasonably well recognized to correspond to the dentinal fibril.

As already stated in chapter VI, the dentinal fibril generally fills the dentinal tubule and firmly combines with the latter under normal conditions—and so we are quite unable to isolate the dentinal fibril by mechanical methods. As a matter of fact, I observed sometimes the dentinal fibril projecting from the fractured edge of the ground section, as is shown in Fig. 52, which is, however, considered to be a very rare occurrence. Under the action of the acid in dentin, the dentinal tubule would expand as the result of the contraction of the basis substance, and at the same time the dentinal fibril would become loosened from conjunction with the tubule, an interstice positively resulting from this change in the two substances. The dentinal fibril, however, will readily become loosened from the tubule from a considerably less action.

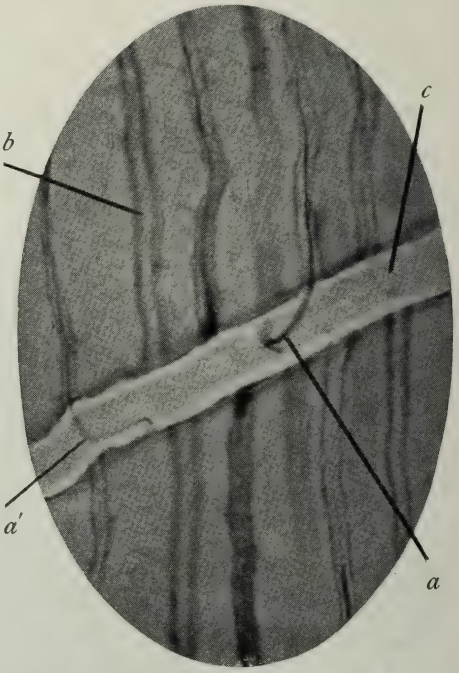
The proof of this fact is shown in Fig. 53. This is the reason why we can isolate the dentinal fibril by tearing the decalcified section.

FIG. 51.



Transversely ground dentinal section, decalcified in 10 per cent. solution of nitric acid, then stained with fuchsin, afterward broken on the object-glass. Magn. 1050 diam. *a*, Dentinal tubule, destroyed at the broken edge, presenting a saw-edge appearance. *b*, Dentinal fibril detached at the broken edge.

FIG. 52.

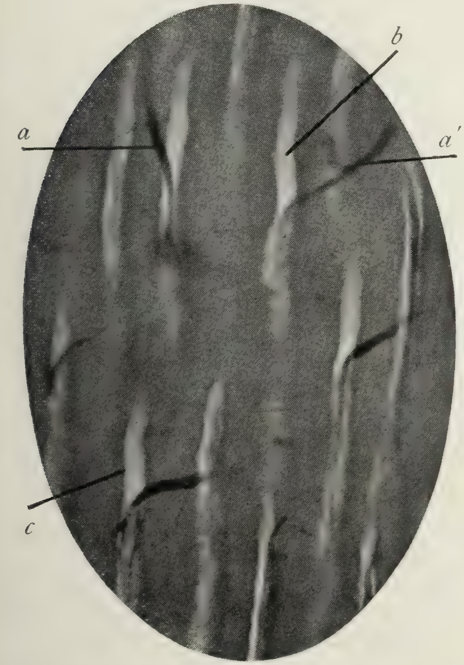


Longitudinally ground dentinal section. Carbol-fuchsin staining. Magn. 1050 diam. Shows dentinal fibril projecting and detached at the broken edge. *a*, *a'*, Dentinal fibrils projecting at the broken edge. *b*, Dentinal fibril and dentinal tubule, the difference between them being indistinct. *c*, Interstice brought out during breaking process.

I shall now present a few further facts to prove that the dentinal fibril, or the process of the odontoblast, is remarkably resistant to mechanical means of preparation.

When a fresh tooth is reduced on a grinder to a thin transverse section of dentin, decalcified in 5 per cent. solution of nitric or hydrochloric acid, washed in water, stained with hematoxylin for more than 6 hours, and then examined, what is observed will be this: The so-called wall of the dentinal tubule stains a deeper violet than the general basis substance, and the dentinal fibril, the content of the former, appears tubular or solid. At the same time, a long dentinal fibril will be observed projecting upward from the circular dentinal tubule. This is a very interesting fact, which I explain as follows:

Fig. 53.



Longitudinally ground dentinal section, decalcified in 10 per cent. solution of hydrochloric acid, and stained with hematoxylin. Shows dentinal fibril emerging from dentinal tubule. Magn. 1050 diam. *a*, *a′*, Dentinal fibril emerging from dentinal tubule. *b*, Hollow dentinal tubule, caused by the removal of dentinal fibril. *c*, Wall of dentinal tubule, or so-called Neumann's sheath.

The so-called dentinal sheath does not possess any particular resistance to the mechanical action, as is the case with the general basis substance, and so, though they were ground down evenly, the dentinal fibril remained, through resistance to the mechanical means, and also because it possessed considerable elasticity.

Furthermore, I frequently observed the same fact, *i.e.* that the dentinal fibril remained protruding for a remarkable length out of the dentinal tubule, because of its special resistance to the grinding, in an obliquely ground section of dentin which was stained in carbol-fuchsin.

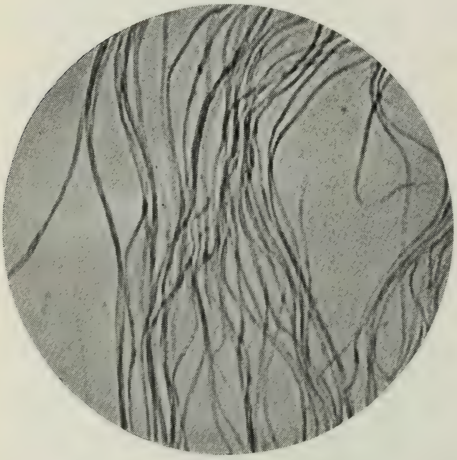
IX. Observations on the Chemically Isolated Sections.

As stated in chapter II, Kölliker discovered, in 1852, the fact that we can isolate the fibrillar substance by treating dentin with a concentrated acid or alkali, and he believed this fibrillar substance to be the dentinal tubule or the process of the odontoblast, which contains a liquid substance (see Fig. 1); but, in 1856, Tomes insisted that the substance which was isolated by mechanical means was the solid dentinal fibril. Upon this Kölliker abandoned his view that the substance which was isolated through the treatment of the dentin with acids or alkalis was the dentinal tubule, and agreed that this was the same substance as Tomes' dentinal fibril (see Fig. 2). In 1863, Neumann pointed out distinctly the difference between the dentinal fibril and the dentinal tubule, and remarked that the dentinal tubule possessed a wall peculiarly resistant to the influence of acids or alkalis and gave it the name of "sheath." (See Fig. 4.)

Neumann's view has been accepted by almost all histologists, and his view—namely, that the substance which is isolated by acids or alkalis is the dentinal sheath—may be looked upon as an established truth. There are more or less differences of opinions among such histologists as Römer, Walkhoff, Fleischmann, as is shown in Fig. 18, regarding the position of the sheath, and also regarding that which is isolatable. To give a more detailed description of their views, Römer thought the dentinal tubule or the process of the odontoblast (part I in Fig. 18) was isolatable. Walkhoff considered part II as the dentinal sheath, which is isolatable, and Fleischmann termed part III the "dentinal sheath," which was considered to be specially resistant to acids or alkalis. It has already been stated that Fleischmann's opinion concurs with that of Neumann. I proved in chapter VI that the part which Walkhoff thought to be an original dentinal sheath was a faulty interstice caused by the action of the acid itself, and so it is clear that this part is not an insolatable substance. Then it follows that that which is isolated by chemical means is the so-called dentinal sheath as claimed by Neumann and Fleischmann, or the dentinal fibril as held by Römer (called the dentinal tubule by the latter histologist).

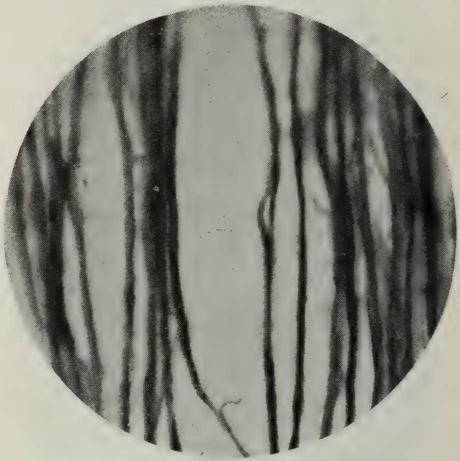
When a newly extracted tooth is ground down for a section of dentin, and put on an object-glass, concentrated acids or alkalis poured over it (I employed 50 per cent. solution of hydrochloric acid exclusively), covered with a cover-glass, warmed until it steams on an alcohol lamp (in case the liquid evaporates, it is supplied continuously), we can easily isolate a fibrillar substance, as is shown in Figs. 54 and 55, but it is quite difficult to ascertain whether the substance is the dentinal tubule or the dentinal fibril. Fleischmann noticed once that when he stained with safranin the fibrillar substance isolated in caustic alkali, there was present an unevenly red-stained material, which he concluded was the dentinal fibril that had been destroyed by the action of the alkali, and consequently that which was isolated was a dentinal sheath. Though I made an examination of the substance that was isolated with safranin or carmine staining, according to Fleischmann, there was not recognized any substance such as the dentinal fibril. Again, when I employed fuchsin I could easily stain the fibrillar substance which was isolated, but when examined with a microscope, though a clear observation was obtained, it was quite uncertain as to its being a den-

FIG. 54.



The fibrillar substance in a longitudinally ground dentinal section, isolated in 50 per cent. solution of hydrochloric acid heated during the preparation. This is regarded as the dentinal fibril. Fuchsin stain. Magn. 580 diam. (Apochrom. dry system 4 mm. Compensation oc. 4.)

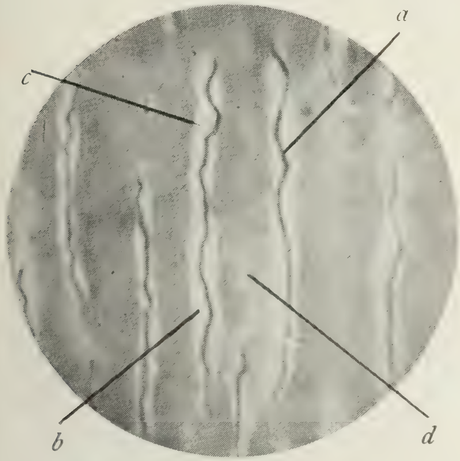
FIG. 55.



The fibrillar substance in a longitudinally ground dentinal section, isolated in 50 per cent. solution of hydrochloric acid. This is regarded as the so-called dentinal fibril. Fuchsin staining. Magn. 1050 diam.

tinal tubule. Whereupon I determined to prepare many ground sections to be submitted to the action of a concentrated acid and afterward treated with staining for varying periods of time for each, and then to observe the whole course of change in which the isolation would be observed specially. Accordingly I made the following preparations:

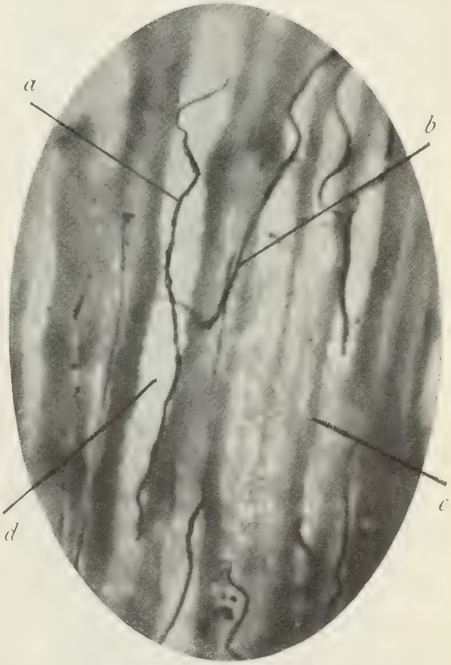
FIG. 56.



Longitudinally ground dentinal section, prepared in 50 per cent. solution of hydrochloric acid heated for a short time, then stained with fuchsin. Magn. 1050 diam. *a*, Wavy dentinal fibril in expanded dentinal tubule. *b*, Transparent layer, or an interstice caused by expansion of dentinal tubule. *c*, Wall of dentinal tubule. *d*, Basis substance lying between dentinal tubules, slightly changed.

I placed a dentinal section ground as thin as possible (less than 10 microns at least) on an object-glass, put on it a drop of 50 per cent. solution of hydrochloric acid, covered it with a cover-glass on the upper surface, warmed it on an alcohol lamp until it steamed or bubbled, and then absorbed the moisture from one side of the cover-glass with blotting paper, when there was seen under the microscope the appearance in greater or less degree of folds upon the dentinal section. The acid was then removed by pouring distilled water over the section little by little. Next I poured into it a newly prepared fuchsin solution from one side, as in the case of water, and after two or three minutes removed the superfluous pigment by means of distilled water, removing the moisture with blotting paper, and embedded the edges of the cover-glass in paraffin. During the process here described special precaution was requisite lest I should move even slightly the cover-glass upon the section while pouring the water or staining liquid and the result be a hopeless failure, as the dentinal section may be changed into a weak and sticky substance under the influence of acid. To avoid such an outcome, the cover-glass was fixed at a small point with paraffin after

FIG. 57.

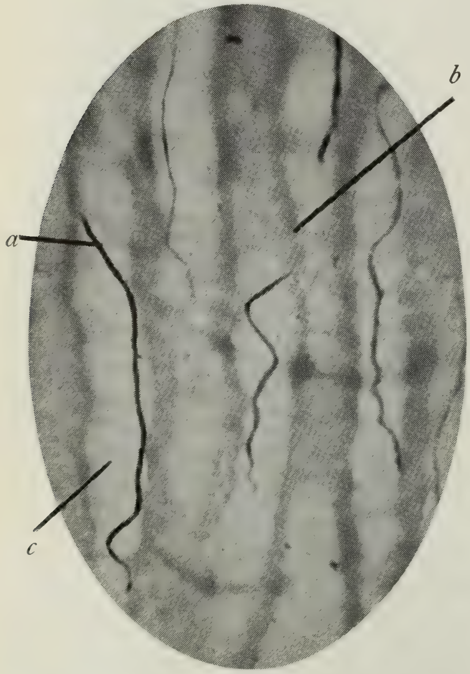


Longitudinally ground dentinal section, placed in 50 per cent. solution of hydrochloric acid heated during preparation, then stained with fuchsin. Magn. 1050 diam. *a*, Serpentine dentinal fibril. *b*, Dentinal fibril emerging from dentinal tubule. *c*, Extremely contracted basis substance between dentinal tubules. *d*, Considerably expanded dentinal tubule.

the process of warming the specimen over an alcohol lamp. Besides this I frequently placed a broken piece of a cover-glass between the cover-glass and the object-glass, in order to allow distilled water and staining liquid to pass easily.

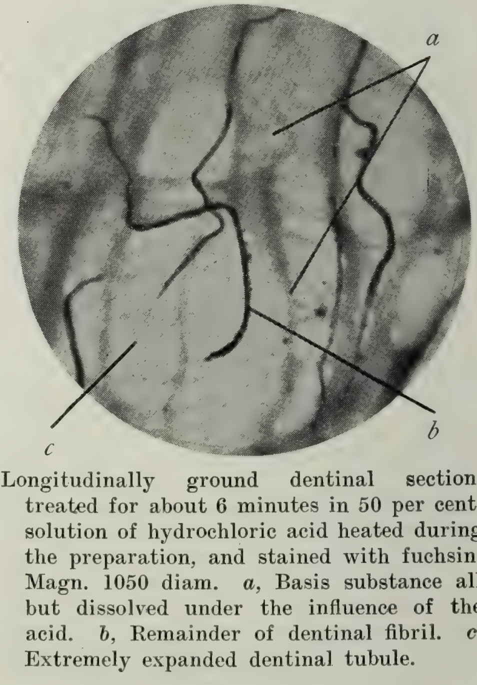
On examining the preparations submitted to the action of acid for a small period of time as mentioned above, we observe the following: The dentinal fibril presents a deep red; the basis substance is beautifully red; the wall of the dentinal tubule and its branches shows a deep red; the interspace between the dentinal fibril and the wall of the dentinal tubule is seen to be transparent. These appearances are similar in all cases of decalcified and stained sections. The dentinal tubule expands remarkably, and the dentinal fibril is in a wavy or spiral condition in the expanded dentinal tubule. (Fig. 56.) As I have so far already explained in the chapters later than chapter V, the dentinal fibril in the ground section almost fills the dentinal tubule, there scarcely remaining a small interstice; but it differs from the decalcified section in that we observe a comparatively wide and transparent interstice between the dentinal fibril and the wall of the dentinal tubule, due to the expansion of the dentinal tubule caused by the action of the acid. For the same reason it is quite plausible to believe that the contraction of the basis substance takes place to a considerable extent under the action of the strong acid during the preparation of the isolated specimen, and expansion of the dentinal tubule might also occur.

Fig. 58.



Longitudinally ground dentinal section, treated for a long time in 50 per cent. solution of hydrochloric acid heated during the preparation, then stained with fuchsin. Magn. 1050 diam. *a*, Serpentine dentinal fibril. *b*, Extremely contracted basis substance between dentinal tubules; the staining is observed as becoming uneven—presaging dissolution of the substance. *c*, Extremely expanded dentinal tubule.

Fig. 59.

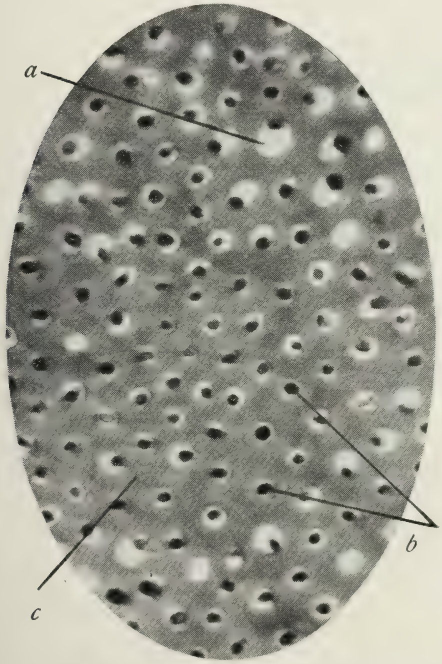


Longitudinally ground dentinal section, treated for about 6 minutes in 50 per cent. solution of hydrochloric acid heated during the preparation, and stained with fuchsin. Magn. 1050 diam. *a*, Basis substance all but dissolved under the influence of the acid. *b*, Remainder of dentinal fibril. *c*, Extremely expanded dentinal tubule.

When we make an examination of a

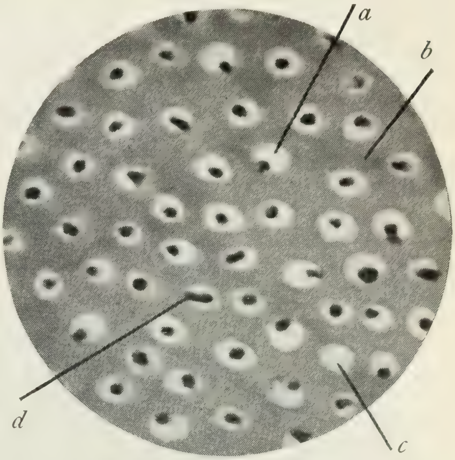
dentinal section which has been treated with the acid for a longer time than had the above specimen, one which has been warmed by the same method as that above mentioned, the dentinal tubule would be expanded considerably, as shown in Fig. 57, and the dentinal fibril would run not only in a serpentine manner, but some portion of it would get off the tubule. The basis substance between the dentinal tubules becomes smaller in size, and some would be stained unevenly with fuchsin, the acid having dissolved a portion of it. At this time we observe distinctly that the wall of the dentinal tubule, or the part which Neumann or Fleischmann considered as the dentinal sheath, takes the staining more deeply than the basis substance in

FIG. 60.



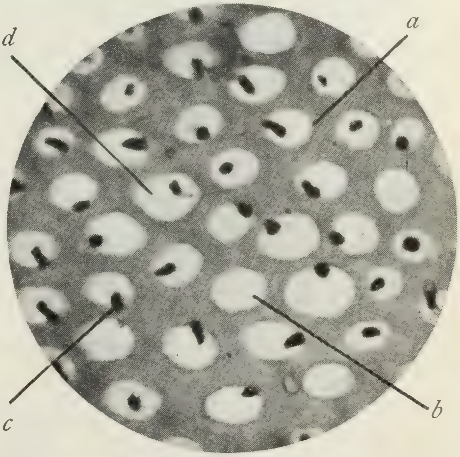
Transversely ground dentinal section, treated for from 1 to 2 minutes in 50 per cent. hydrochloric acid heated during the preparation, then stained with carbol-fuchsin. Magn. 1050 diam. *a*, Interstice created by expansion of dentinal tubule. *b*, Dentinal fibril; dentinal sheath not expanded. *c*, Basis substance, still unchanged.

FIG. 61.



Transversely ground dentinal section, treated for 2 or 3 minutes in 50 per cent. solution of hydrochloric acid, then stained with fuchsin. Magn. 1050 diam. *a*, Interstice created by expansion of dentinal tubule. *b*, Slightly changed basis substance. *c*, Hollow dentinal tubule, from which dentinal fibril has fallen off. *d*, Dentinal fibril lying vertically in dentinal tubule.

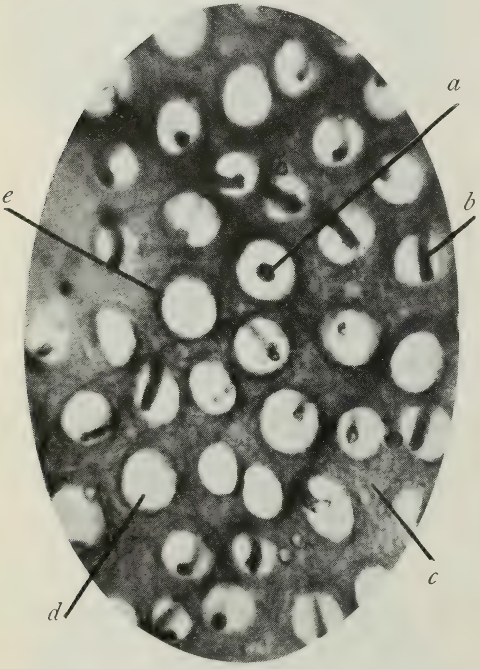
FIG. 62.



Transversely ground section of dentin, treated for 2 or 3 minutes in 50 per cent. solution of hydrochloric acid, then stained with fuchsin. Magn. 1050 diam. *a*, Wall of dentinal tubule. *b*, Hollow dentinal tubule from which dentinal fibril has fallen off. *c*, Dentinal fibril all but extruding from the dentinal tubule. *d*, Interstice resulting from expansion of dentinal tubule.

general, and further that it is about to be destroyed by the acid. The fact that we observe a more or less cloudy substance inside the expanded dentinal tubule would indicate probably the prelude to the change of the basis substance, which lies in either the superficial or the deep portion of the dentinal tubule, when the dissolution was about to take place.

Fig. 63.



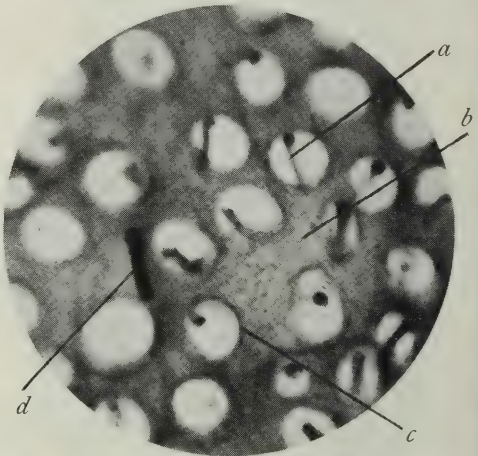
Transversely ground section of dentin, treated for 4 or 5 minutes in 50 per cent. solution of hydrochloric acid heated during preparation, then stained with fuchsin. Magn. 1050 diam. *a*, Dentinal fibril lying in center of expanded dentinal tubule. *b*, Dentinal fibril inclined obliquely. *c*, Basis substance stained unevenly. *d*, Hollow dentinal tubule from which dentinal fibril has fallen off. *e*, Wall of dentinal tubule.

Fig. 58 shows the basis substance between the dentinal tubules further contracted, and consequently the dentinal tubule extremely expanded. The so-called dentinal sheath is about to be destroyed gradually by the action of the acid to the same degree as the destruction of the basis substance. The dentinal fibril is, however, scarcely changed, and remains exceedingly red-stained.

In Fig. 59 the basis substance and the dentinal wall of the dentinal tubule are almost destroyed from the influence of the acid exerted for a considerable length of time, and only the dentinal fibril remains stained extremely red with fuchsin.

To judge from the results of the aforementioned researches, it is obvious that the fibrillar substance which remains after the long treatment of the dentin with the acid is not the so-called dentinal sheath which forms the wall of the dentinal tubule, but simply a dentinal fibril. In other words, the basis substance and the dentinal sheath have weak resistance to the acid, while the dentinal fibril has certainly a comparatively strong resistance. I hereby claim that the opinion maintained by many histologists since Neumann—that is, that the dentinal tubule has a sheath which is

Fig. 64.



Transversely ground dentinal section, treated for 4 or 5 minutes in 50 per cent. solution of hydrochloric acid, then stained with fuchsin. Magn. 1050 diam. *a*, Dentinal fibril lying inclined in expanded dentinal tubule. *b*, Basis substance stained unevenly. *c*, Wall of dentinal tubule, still capable of staining. *d*, Dentinal fibril emerging from the dentinal tubule.

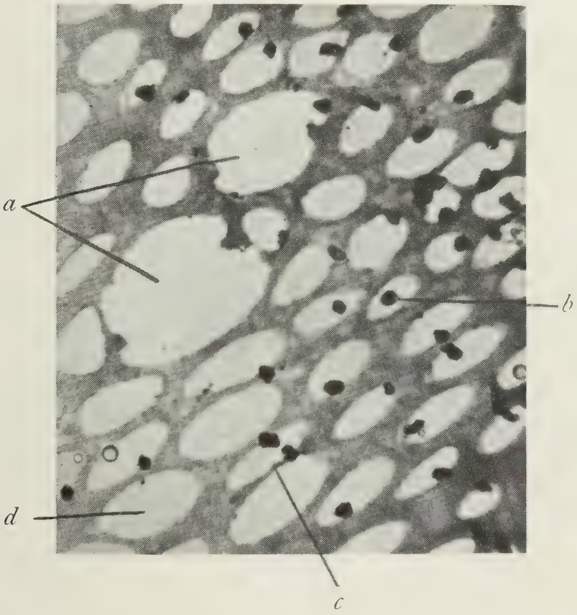
resistant to the chemical reagent—is a misconception, and that Römer's opinion is right.

In order to confirm still more strongly the results of the above researches I prepared many thin transverse sections of dentin, which were submitted to fuchsin staining after treatment in 50 per cent. solution of hydrochloric acid, and examined the process of the isolation. In these cases, also, the dentinal fibril which lies always in the center of the dentinal tubule, remained without any change, as shown in Figs. 60–66, while it is noticed that the wall of the dentinal tubule is all but changed and is destroyed gradually, just like the change that takes place in the basis substance. The dentinal fibril remained like a spot in the dentinal tubule at first, as is seen in Fig. 60, and afterward it lay obliquely or horizontally in the expanded dentinal tubule in proportion to the gradual action of the acid (Fig. 66), and frequently it gets off the tubule (Fig. 64). These results are the same as those observed in the longitudinal sections.

During the preparation of the isolated section of dentin, we would meet with failure owing to the prompt dissolution of the dentinal fibril, which had been isolated successfully, if it were treated for too long a time in the acid, or heated abruptly, and we would gain nothing at all as the result. This fact does not prove that the dentinal fibril is particularly different in resistance to reagents in comparison with the basis substance.

Römer prepared a ground section saturated with chlorid of gold, which he treated in a concentrated solution of hydrochloric acid, as I stated in the method

Fig. 65.

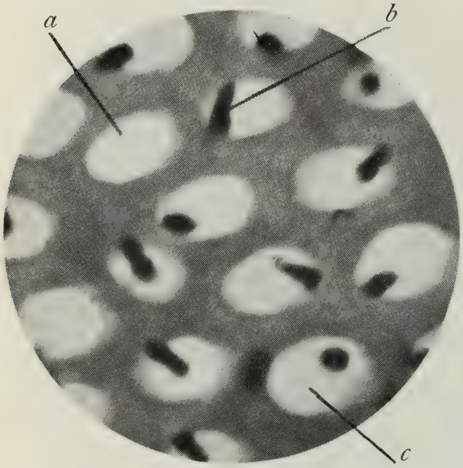


Transversely ground dentinal section, treated for about 6 minutes in 50 per cent. solution of hydrochloric acid, then stained with fuchsin. Magn. 1050 diam. *a*, Large interstice created by the uniting of expanded dentinal tubules. *b*, Dentinal fibril. *c*, Extremely contracted basis substance between dentinal tubules. *d*, Expanded dentinal tubule, from which dentinal fibril has already fallen.

"e" in the chapter on Technique, and could isolate successfully a black fibrillar substance, which he considered to be a dentinal fibril or a dentinal tubule. But he has scarcely interpreted the process of the isolation of this tissue.

When I examined under the microscope a ground section which had been saturated with chlorid of gold or nitrate of silver, according to Römer's method, I could very clearly observe fibrillar substances and many branches which pass through the colorless substance, but the nature of the fibrillar substance was not positively ascertained, or whether it might be the dentinal fibril or the dentinal tubule and the dentinal fibril. (See Fig. 68.) Accordingly, it was quite difficult to decide to which of the above two the fibrillar substance which was isolated by strong acid should belong. Whereupon I examined a specimen prepared by the following method (see Fig. 67):

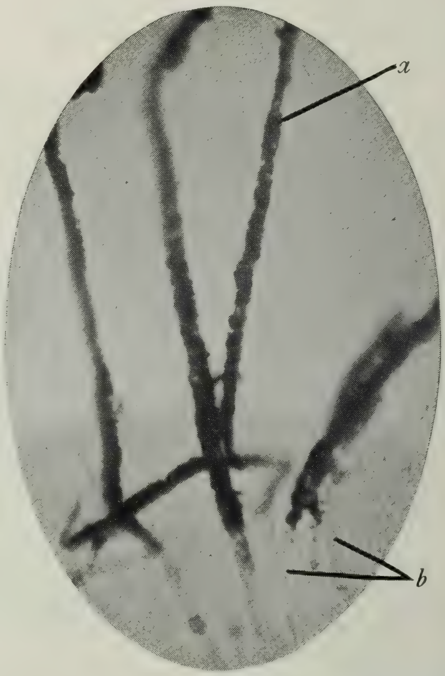
Fig. 66.



Transversely ground dentinal section, treated for 4 or 5 minutes in 50 per cent. solution of hydrochloric acid heated during the preparation, then stained with fuchsin. Magn. 1800 diam. *a*, Hollow dentinal tubule, dentinal fibril having fallen off. *b*, Dentinal fibril lying inclined vertically close to wall of expanded dentinal tubule. *c*, Interstice created by expansion of dentinal tubule.

A ground section which had been impregnated with chlorid of gold or silver was treated with the solution of hydrochloric acid for decalcification, and after thorough washing stained with hematoxylin or fuchsin, and examined under the microscope. What was observed was this: There appeared distinctly a layer deeply stained by hematoxylin or fuchsin outside of the black fibrillar substance in the ground section, as seen in Figs. 26, 27, and 69.

Fig. 67.

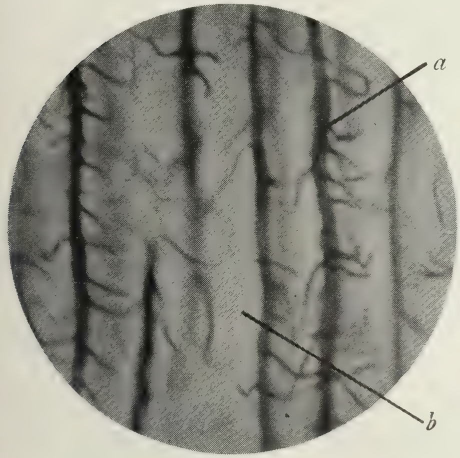


Longitudinally ground section of dentin, impregnated with nitric acid, and then isolated in 50 per cent. solution of hydrochloric acid heated during the preparation. Magn. 1050 diam. *a*, Isolated dentinal fibril, its bulk increased as the precipitate of silver salt deposits around it in a granular state. *b*, Isolated dentinal fibril, without precipitate of silver salt.

From this observation it is obvious that the greater part of the former substance should correspond to the dentinal fibril. Further, in this case, as the metallic salt deposits on the circumference of the dentinal fibril in a black and granular appearance, the fibril appears very notably larger than that observed in the stained sections prepared by other methods.

Furthermore, I treated the ground section, which had been impregnated with metallic salt, with the 50 per cent. solution of hydrochloric acid, and then stained it with fuchsin. Observation of this section, especially regarding the process of the isolation, showed that comparatively large dentinal fibrils remain entirely surrounded with granular metallic salt.

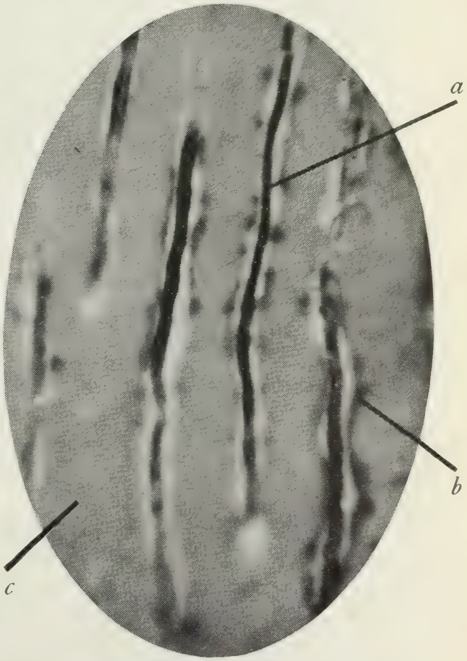
FIG. 68.



Longitudinally ground dentinal section, impregnated with nitrate of silver. Magn. 1050 diam. *a*, Dentinal fibril and wall of dentinal tubule, on which silver salt precipitates and deposits; many branches are recognized. *b*, Unstained basis substance.

In 1913 Walkhoff reported, in the results of his researches as published in the *Vierteljahrsschrift für Zahnheilkunde,* H. 1, that he treated dentinal sections with acids and alkalis and observed the process of isolation in the sections. He says that the three substances—dentinal fibril, basis substance, and bordering layer (the part considered as a dentinal sheath by Fleischmann)—are easily destroyed by the acid, but that the dentinal sheath (that which was considered an interstice by Fleischmann) will remain and be isolated. I cannot concur with Walkhoff's opinion, but am inclined to believe that it is extremely difficult to observe the process of isolation by the preparation described by him. I introduce here his method of preparation and interpretation of the result. (Figs. 70, 71.)

FIG. 69.



Longitudinally ground section of dentin, impregnated with nitrate of silver, decalcified in 10 per cent. solution of hydrochloric acid, and stained with fuchsin. Magn. 1800 diam. *a*, Dentinal fibril, presenting a black tint resulting from the precipitation of the silver salt. *b*, Wall of dentinal tubule stained by fuchsin. *c*, Basis substance.

Fig. 70 shows the dentinal tubule in longitudinal section; the beginning of the isolation of the dentinal tubule after treatment with nitric acid and potassium chlorid. The isolation is initiated by the surface of the dentinal sheath becoming granular—this by a destruction of the bordering layer. The dentinal fibril, *i.e.* the lumen for the same, is still visible in many places.

Fig. 71 shows the beginning of isolation in a cross section of the dentinal tubule. The dentinal sheaths assume in part a more angular form. At *a* they are still closely associated with the basis substance, and the lumen of the dentinal tubules is still rather marked. At *b* the dentinal sheaths have already been iso-

FIG. 70. (*After Walkhoff.*)

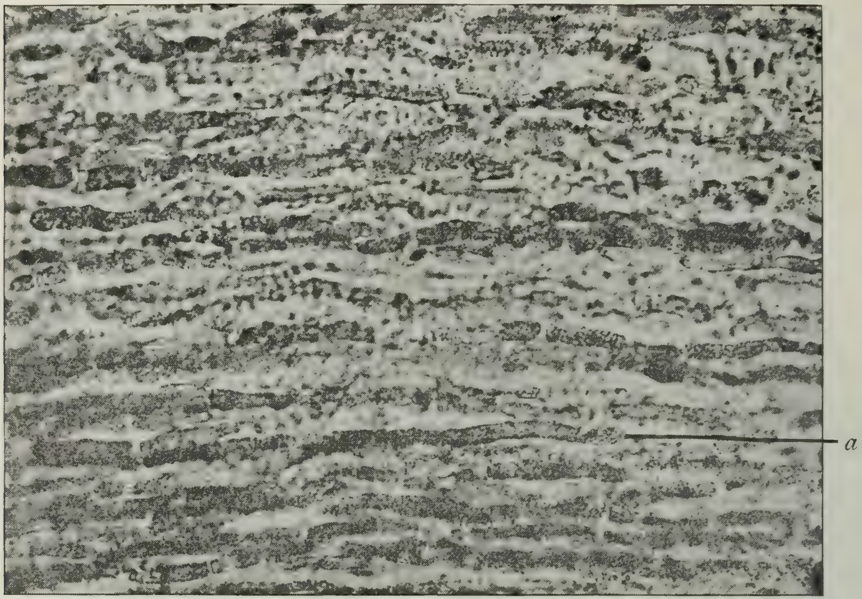
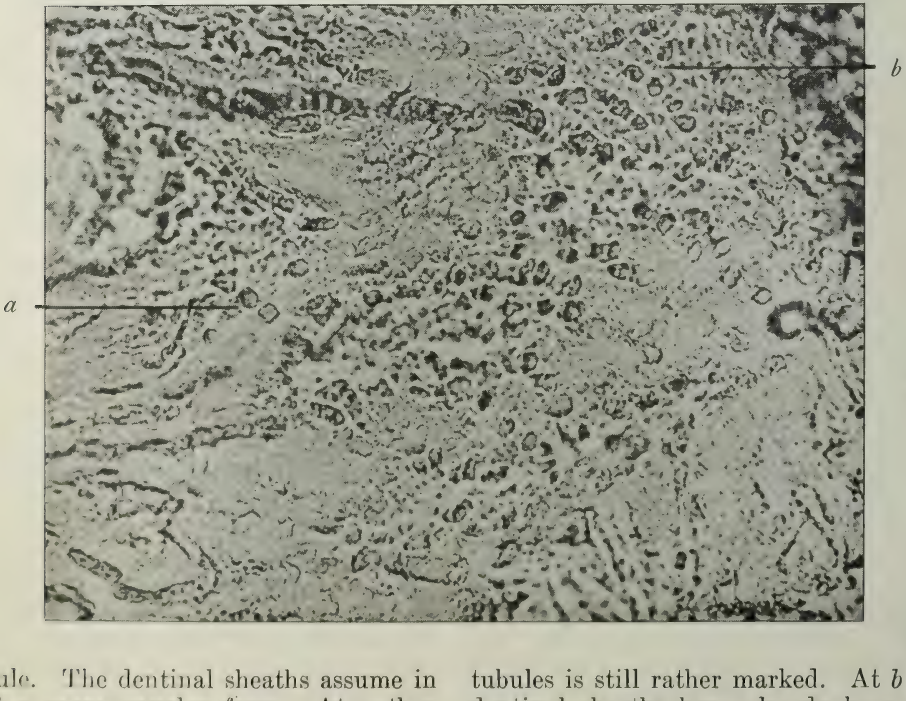


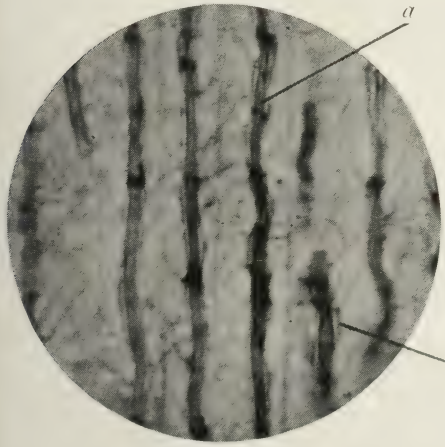
FIG. 71. (*After Walkhoff.*)



lated from the basis substance, and their diameter has already significantly diminished.

Kantorowicz considered that the fibril in the dentin would putrefy and disappear in a tooth in which the pulp had died, but when I examined many ground or decalcified sections which were prepared from pulpless teeth, I could recognize the existence of the dentinal fibril in the so-called dentinal tubule, with the exception only of the previously degenerated portion of the fibril caused by bacteria from the pulp cavity. (Fig. 72.) It was easily possible to isolate the dentinal fibrils when submitted to the acid according to the above-mentioned method. It is obvious that when the pulp putrefies the odontoblast putrefies, and the dentinal fibril, the process of the odontoblast, will lose vitality in the dentinal tubule. The dentinal fibril, however, certainly remains, without any change in appearance, as long as the bacterial attack does not occur.

FIG. 72.

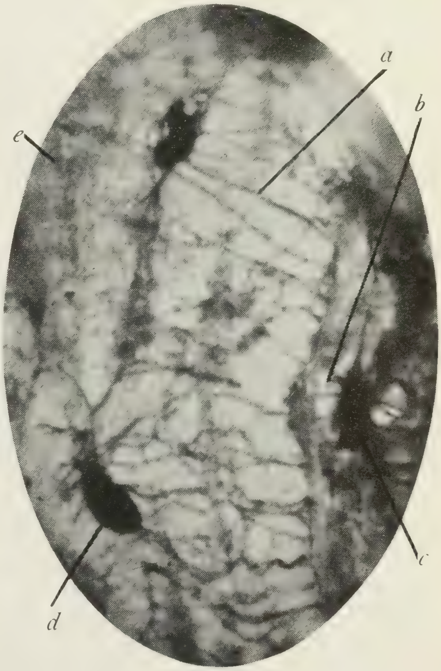


Longitudinal decalcified dentinal section of a human tooth which remained pulpless for a few years. Hematoxylin staining. The dentinal fibril is demonstrated distinctly. Magn. 1050 diam. *a*, Dentinal fibril. *b*, Wall of dentinal tubule.

Further, Walkhoff explained that the destruction of the dentinal fibril occurs when it is dried up, but I could actually observe the presence of the dentinal fibril in the dentinal tubule when I examined a decalcified section which had been kept in dried-up condition for twenty years and longer, and I could isolate the dentinal fibril by the action of the acid.

The various facts above stated would seem to prove that though the dentinal fibrils lose vitality, there is no change in the shape of the fibril, and besides, that it has a strong resistance to chemical reagents even in a dried-up condition.

FIG. 73.



Transversely ground section of a human femur, treated in 50 per cent. solution of hydrochloric acid heated during the preparation, then the bone cells and their processes isolated. All the basis substance is not yet dissolved. Fuchsin staining. Magn. 1050 diam. *a*, Process of the bone cells. *b*, Bone lacuna expanded by action of the acid. *c*, *d*, Bone cells. *e*, Basis substance still remaining.

That the dentinal tubules in the dentin differ in shape, in accordance with location, is a well-known fact. For example, they are larger in the portion near the pulp cavity, and become smaller toward the surface of the tooth. Accordingly, the dentinal fibril, or the content of the tubule, is not always the same size. Therefore, when an isolated section is prepared from the part near the pulp cavity we obtain comparatively large dentinal fibrils, and smaller ones at the part near the surface of the tooth.

The dentin has a similar construction to that of bone, and so the odontoblast can well be compared to the osteoblast; the dentinal tubule to the bone canaliculi; the dentinal fibril, or the process of the odontoblast, to the process given off from around the osteoblast—the difference between the two being that the cells lie embedded in the basis substance in bone, while in dentin they occur in rows on the walls of the so-called pulp cavity and give forth processes into the dentinal tubules. Encouraged by these facts, I came to believe that bone cells could be isolated from bone canaliculi and its process, on being treated with acid, as in the case of dentin, and I accordingly prepared a specimen of bone by the following method:

The femur of a man of twenty-five years, who had died of consumption, was cut transversely and a thin section prepared by grinding down on a grinder, poured over it a 50 per cent. solution of hydrochloric acid, warmed it over an alcohol lamp, and then stained it with fuchsin. The results were as follows:

In accordance with the gradual influence of the acid, the bone lacunæ expanded remarkably, and the cells and their processes still remained after the solution of the basis substance—as seen in Fig. 73.

This problem is still being studied and will be discussed in detail later on.

X. Conclusions.

Recapitulating the results of my research, the following conclusions are presented:

(1) Dentin is composed of a basis substance similar to that of bone, and numerous dentinal tubules, which contain dentinal fibrils, permeating the basis substance.

(2) The dentinal fibril is a process of the odontoblast, and presents apparently the form of a tube, as it possesses a bordering layer which stains with hematoxylin and basic colors. It is composed of protoplasm. The bordering layer is believed to consist of protoplasm closely condensed.

(3) The dentinal fibril has tubercular portions at several points, which are considered as points from which comparatively large branches would issue.

(4) The dentinal fibrils give forth numerous branches from the outside, each branch penetrating into a small branch of the dentinal tubule.

(5) The dentinal fibril has a remarkable elasticity, which is positively the cause of the wavy or spiral process which the fibrils exhibit frequently in sections.

(6) The dentinal fibrils do not possess a tendency to contraction by the action of any reagent at the time of the preparation of sections, but rather become more or less enlarged by the action of acid.

(7) The dentinal fibril has much more resistance to mechanical or chemical action than have the basis substance and the wall of the dentinal tubule.

(8) The dentinal tubule has a wall that is close to the basis substance and takes color from basic pigments. This wall may be considered as uncalcified or slightly calcified basis substance, as it is also stained in ground sections.

(9) The dentinal tubules give off numerous small tubular branches from their outside surfaces, which anastomose with the neighboring tubules. These small tubular branches contain branches of the dentinal fibrils.

(10) There is a certain interstice between the dentinal fibril and the wall of the dentinal tubule in which liquid circulates. The interstice appears larger in decalcified sections than in the normal state. This is because the basis substance intervening between the dentinal tubules contracts under the influence of the acid, and subsequently causes the expansion of the dentinal tubule.

(11) The layers seen circular and prominent in transversely ground sec-

tions, and the transparent layer observed surrounding the dentinal tubules, are virtual images.

(12) The fibrillar substance isolated by mechanical and chemical methods is the dentinal fibril, and is not the so-called dentinal sheath.

(13) The wall of the dentinal tubule has no special resistance to acids or alkalis, and as it cannot be isolated, it is unreasonable to call it a "sheath."

Finally, I wish to express my grateful appreciation to Dr. Oskar Römer, whose kindness and helpful guidance assisted me greatly in this work; and now profound regret dominates my heart, in that I am not in a position to dedicate this paper to one of the greatest scientists in Germany.

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Report of Two Cases of Lung Abscess Caused by Dental Mishaps.

By T. O. HEATWOLE, M.D., D.D.S., Baltimore, Md.

(Read before the New Jersey State Dental Society, Asbury Park, July 14, 1916.)

YOUR speaker realizes that he is not presenting a new subject for your consideration, but hopes only to add something in the line of a further warning against possible mishaps, and to report several cases coming under recent observation.

Many writers in the past have dwelt on the absolute necessity for strict attention to details while extracting teeth, and especially so while operating under a general anesthetic. Precautionary measures against untoward results have repeatedly been pointed out to the profession, and in the literature of today there are cited a number of cases in which the life of the patient was endangered, and in not a few instances death itself resulted from the aspiration of teeth, roots of teeth, crowns, and slivers of crushed crowns of teeth, during extraction and while adjusting bands and crowns in dental operations. Despite all this we not infrequently hear of some unfortunate experiences met with by practitioners which are being classed as "accidents." These so-called accidents, however, might have been avoided had the warnings of those competent to advise been regarded seriously, and recommendations followed as to precautionary measures.

One reason, and perhaps the chief reason, for the lack of a more universal observance of the advice given by those who heretofore have volunteered the same, is the failure of the average dentist to fully comprehend the exact mechanism and position of that portion or division of the respiratory tract known as the larynx, with its associated parts. To those familiar with the location, structure, and general surroundings of this organ and its contained parts, and its peculiar functioning, the need for special caution becomes vitally apparent. Being both intimately related and immediately contiguous to our particular field of operation, it should be of special interest to us as a profession to know more about this subject; and be it said to the credit of progressive dental schools of today, the subject of the nose and throat has been given a place in the curriculum.

GENERAL ANESTHESIA CONDUCIVE TO DENTAL MISHAPS.

Deglutition, or the act of swallowing, may be said to consist of three stages, viz, the passage of the substance swallowed through the oral cavity, through the pharynx, and through the esophagus. The last stage of this act is controlled by a center in the medulla oblongata, which center is stimulated by any substance coming in contact with the peripheral nerve-endings in the pharynx. During general anesthesia these reflexes, together with all others—vital reflexes excepted—are abolished, and as a result foreign objects finding their way into the pharynx pass rather easily and naturally into the open larynx, the movement in that direction being augmented by the force of the respiratory current. In fact, individuals when normally asleep or anesthetized always breathe more heavily than while awake, and consequently objects such as teeth, roots of teeth, or other substances which, through one means or another, find their way into the pharynx, are not infrequently aspirated into the respiratory tract.

On the other hand, conscious patients, whose faculties are normal and unaffected by narcotics, may either swallow or aspirate such bodies, the course taken being somewhat dependent upon the temperament of the individual. Every dentist knows the tendency of nervous, irritable patients to become startled and to gasp when sudden and unexpected conditions present themselves. Such startled gasping is well calculated to suck into the respiratory tract misplaced objects which may come in contact with the surrounding parts.

DEFORD ON DENTAL MISHAPS.

In his most excellent book on "General Anesthetics in Dentistry," William Harper DeFord, A.M., D.D.S., M.D., on pages 295 and 296 cites various cases of mishaps along the line of our discussion, as follows:

> In a case reported by Mr. Claremont, some fragments of teeth entered the larynx during chloroform anesthesia. When the patient became conscious, after the operation was over, coughing occurred, and a complaint was made of soreness about the chest. There were, however, at the time no distinct symptoms of the presence of the fragments. General bronchitis followed. Subsequently the fragments were coughed up from the lungs, and the patient made a good recovery.
>
> A case is also mentioned in the *Dublin Medical and Chemical Journal* in which the roots of a lower molar entered the right bronchus after extraction. Death supervened in eleven days.
>
> Another case is reported in the *Edinburgh Journal,* in which an entire lower molar entered the lung. It was coughed up on the eleventh day, and the patient recovered.
>
> In the *British Journal of Dental Science,* January 1879, a case is related in which a large amalgam filling "shot" from a tooth during extraction under nitrous oxid, and presumably entered the larynx. Fortunately the patient coughed it out immediately after the effects of the anesthesia had passed off.
>
> In a case referred to in the *British Medical Journal,* February 1899, an extracted tooth entered the larynx during nitrous oxid anesthesia, causing extreme cyanosis; subsequently there was a feeling of tightness in the throat, aggravated by speaking or by change of posture. No breath sounds were audible over the left lung. Death took place in twelve days. At the necropsy the tooth was found in the left bronchus.
>
> A case has lately been reported to the author in which a medical man, while sponging out the throat during a dental operation under ether, inadvertently pushed an extracted tooth backward. It was hoped that the patient had swallowed the tooth. For three weeks she suffered from certain chest symptoms, which she ascribed to the anesthetic. At the end of this time the tooth was coughed up and no further trouble followed. (Hewitt.)

The above cases date back some years, but it is probable that many others might be quoted of more recent occurrence had they been reported.

CASE I: GOLD SHELL CROWN ASPIRATED BY PATIENT.

The first case to be reported tonight you will agree is both remarkable and most pathetic. Let me say just here that the beginning of this patient's experience was with a professional advertiser, and runs as follows:

> Mrs. F., forty-three years of age, married, mother of six children, presumably in robust health at the time, on March 17, 1909, visited one of the "dental parlors" located in Baltimore. The upper right canine was prepared for an adaptation of the characteristic gold shell crown. In the attempt to adjust the crown it slipped from the operator's grasp and disappeared. A search of the surroundings was made, but to no avail. The only explanation offered was that she must have swallowed it. At any rate, she was dismissed, and sent home with the crown in her possession, as was later revealed, but not in its intended position. Violent fits of coughing ensued; so extreme was this condition that emesis frequently resulted. After three days had elapsed she consulted a physician, who, after hearing her story, made an examination, finding nothing. During the following three months the patient had a poor appetite and lost considerable flesh. At the end of this period she saw the physician again. He ordered an X-ray picture made. This proving negative, the doctor advised that she go home and forget her trouble, at least in so far as it related to her idea of something being in her respiratory tract. The patient continued to cough; the sputum was scanty, but at times blood appeared in expectorated matter. She next went to an eminent throat specialist, who discovered what appeared to be an enlargement in the throat. An operation was performed, but resulted in nothing being found. The patient up to this time continued her household duties for her family, though greatly emaciated and reduced in strength. She next spent one week in a hospital. Pictures of the throat and chest were taken, all proving negative. The symptoms given by the patient referred almost entirely to the throat. The hospital physician, thinking that he felt something in the throat, removed the right tonsil and made incisions in the throat area in the hope of finding something. The result again proved fruitless.

The patient did not again seek medical aid for more than one year, the decline in general health continuing, and with no abatement in her cough. Later another physician was consulted, and pictures of throat and chest were made. The object was supposed to have been located in the throat. After a consultation with the former physician and a comparison and study of pictures made by both, it was decided that the object showing could be the hyoid bone. Nothing was done. The fact of the woman's having passed through the hands of so many competent physicians and specialists, who were unable to discover anything or give relief, stamped her as a neurasthenic. Her regular physician was in attendance for some time, giving such general treatment as the case required. Finally, in desperation, she entered the hospital on the recommendation of a friend, and was placed under the care of a well-known surgeon. Pictures of the throat and chest were made, the object again supposedly showing itself in the throat. An operation from the outside of the neck was performed, but nothing was found. The family physician continued his general treatment for two years, all the while conscious of the fact that his patient was continuously losing ground. On the physician's recommendation the patient consented to again enter the hospital for the purpose of having a surgeon of his own selection attempt to locate the trouble. From this point the hospital record is quoted:

> The patient, white, fifty years of age, entered the University of Maryland Hospital on May 2, 1915. She complains of a continuous irritation in her throat, and a constant cough which brings up a quantity of purulent mucus, also suffers from an impaired voice, phonation and articulation being good, but the voice very husky. She gives a history of having aspirated an artificial gold shell crown while in a dentists chair, seven years ago. Patient states that while the dentist was working in her mouth and in the act of cementing it in place, the crown slipped from his grasp and entered the trachea. After this accident occurred she felt constant irritation in her throat and had a desire to cough all the time. A throat specialist was consulted, who dis-

sected away the posterior pillar of the fauces and tonsil on the right side and a portion of the superior laryngeal muscle, claiming at the time to have secured the foreign body. A large amount of scar tissue resulted from the operation, and added to the discomfort of the patient. A chest examination disclosed nothing definite, except an aortic murmur.

On May 4th patient was taken to the X-ray room and her thorax radiographed with the idea of finding a possible aneurysm. After the plate became dry and could be studied, a foreign body was noted in the right side of the chest, which in shape and size resembled the crown of a tooth. No aneurysm was seen. On the following day a series of stethoscopic examinations were made to locate the exact position of the foreign body. This revealed a definite drain-tract opening into the bronchus.

After a careful study of the X-ray plates and a positive diagnosis being made, the patient and her family were advised on May 15th of the possibilities and dangers of an operation on the substance of the lung. The patient decided that it would be better to take the chance rather than remain in her present condition. She was taken to the operating room on the afternoon of the same day, the field of operation prepared, and all things being placed in readiness, the anesthetist was signaled to proceed. The agent employed was nitrous oxid with oxygen through the entire operation. A semicircular incision was made on the back, exposing the seventh, eighth, and ninth ribs. The periosteum of the ribs was quickly stripped off, the ribs resected for about four inches, exposing the pleural cavity. The lower lobe of the lung was palpated between the two index fingers until a hard substance was located, and a puncture of the intervening tissue allowed its removal.

The patient was discharged from the hospital on June 24, 1915, her condition at the time being greatly improved.

CASE II: ASPIRATION OF PORTION OF FRACTURED TOOTH.

Miss B., white, age twenty-six years, a few days prior to May 12, 1915, had teeth extracted by a dentist located in a Maryland town. The patient's physician administered ether as the anesthetic. Shortly after this experience she developed what appeared to be pneumonia, and for ten days was quite ill. Her physician attributed the pneumonia to the irritating effects of the anesthetic. At the termination of the period usually required for this disease to run its course the patient failed to make a satisfactory recovery. She continued to lose weight, and failed to regain her strength, running a temperature during the evening of each day.

Her physician finally advised that she go to the hospital for further treatment.

She entered the University of Maryland Hospital on June 1, 1915. Her condition showed emaciation and symptoms of toxemia. The patient coughed almost incessantly, bringing up large quantities of purulent, frothy mucus. The chest expansion on the right side showed impairment below the fourth rib, the left side being apparently normal. There was dulness on percussion posterior to mid-axillary lines on the right side below the fifth rib. An X-ray picture of the thorax proved unsatisfactory in that nothing definite of diagnostic value appeared. On June 6th an aspirating needle was put into the chest at the dull area, and two cubic centimeters of pus withdrawn. On June 9th the patient was operated upon, a resection of the sixth rib being made posterior to the axillary line, and free drainage provided. Some weeks later, while the patient was still in the hospital, she coughed up a sliver of tooth substance which evidently had escaped the notice of both physician and dentist and found its way into the respiratory tract, later burying itself deeply in the lung tissue, and doubtless being the cause of all the trouble.

From this time on the patient's recovery was gradual, she being discharged from the hospital on June 29, 1915.

MEANS SUGGESTED FOR GUARDING AGAINST DENTAL MISHAPS.

And now, having discussed at some length unfortunate conditions which have arisen in the past, and bearing particularly on dental operations, it behooves us next to call attention to the means by which such mishaps may be safeguarded against, especially during anesthesia.

Fortunately, the remedy here to be recommended is simple and easy of application. After the patient has been anesthetized, take what is known in hospital parlance as long gauze and pack off the throat posteriorly, filling in the intervening space between the root of the tongue and the soft palate with the packing, allowing the free end of the gauze to extend from the mouth. The only contra-indication against the employment of this packing is the blockage of the nasal passage by adenoid tissue or other obstruction. The employment of such means will prevent blood from passing into the thoat, and at the same time give absolute protection against the backward passage of objects such as we have had under discussion. Fractured particles of teeth themselves are just as liable to fly backward as forward when they escape from our grasp, and one cannot justify himself in taking a chance while doing a hasty operation with his patient under an anesthetic.

Perhaps the feelings of those responsible for the unfortunate conditions above described can in a measure be imagined by bringing to your attention the experience of a dentist practicing in a rural district in one of our Southern states, and related by himself.

A male patient appeared for tooth extraction. The operation proved somewhat difficult, and on finally leaving the socket the tooth escaped from the forceps and dropped into the patient's trachea. He gasped for breath, turned blue in the face, and cast anxious and appealing glances at the dentist. Being at a loss to know what to do, the dentist finally inclined the patient forward with his face over the cuspidor, and proceeded to soundly thump him on the back. His efforts were soon rewarded, as evidenced by the welcome sound of the tooth dropping into the cuspidor.

The dentist's peroration, after relating the above story, follows: "Gentlemen, I have been married twice in my life, I have confessed conversion on various occasions, but the joyous feelings which entered my heart, being produced by that sound, exceeded those of all other happy occasions put together."

LOMBARD AND GREEN STS.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

Report of a Case of a Dermoid Cyst Lying Within the Floor of the Mouth.

By M. N. FEDERSPIEL, B.Sc., D.D.S., M.D., Milwaukee, Wis.,
PROFESSOR OF ORAL SURGERY, DENTAL SCHOOL, MARQUETTE UNIVERSITY, MILWAUKEE, WIS.

DERMOID cysts are congenital in origin, caused by the inclusion of the epiderm within the tissues formed from the mesoderm. They are usually formed in the generative organs, but may be found in various parts of the body. The lining consists of stratified epithelium containing dermoid elements such as hair, skin, teeth, nails, sebaceous matter, and more often a thick, creamy, yellowish fat.*

Dermoid tumors, as a rule, are not noticeable at birth or in the young. They do not destroy life, and they may exist throughout life and give little or no inconvenience. Like other cysts, however, they may at any time undergo pathological changes and become malignant, or in their growth displace adjacent structures so as to impair function.

Dermoid cysts when found in the floor of the mouth occur in one of two situations—in the midline beneath the skin or between the genio-hyoglossi muscles, or laterally below the angle of the jaw.†

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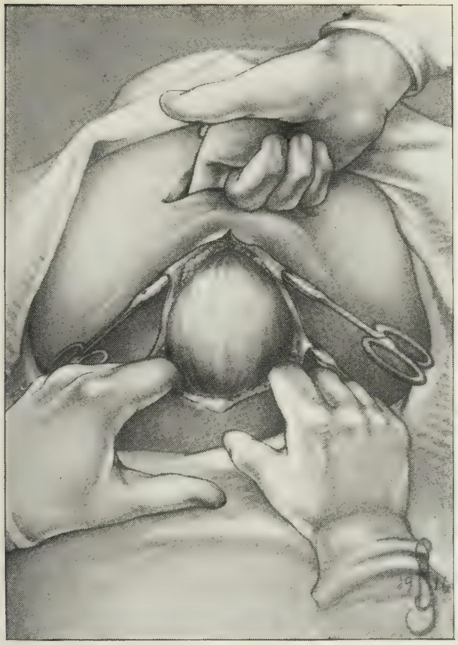
* Dudley, "Principles and Practice of Gynecology."

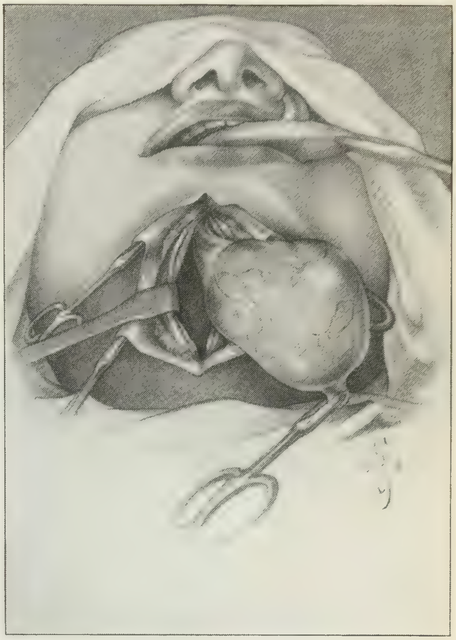
† Blair, "Surgery and Diseases of the Mouth and Jaws."

FIG. 1.



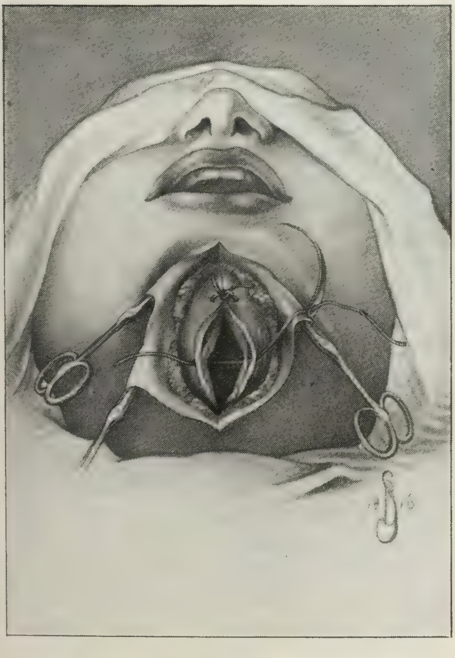
First step of operation: Separating fascia with pressure brought on the tongue to force mass out.

FIG. 2.



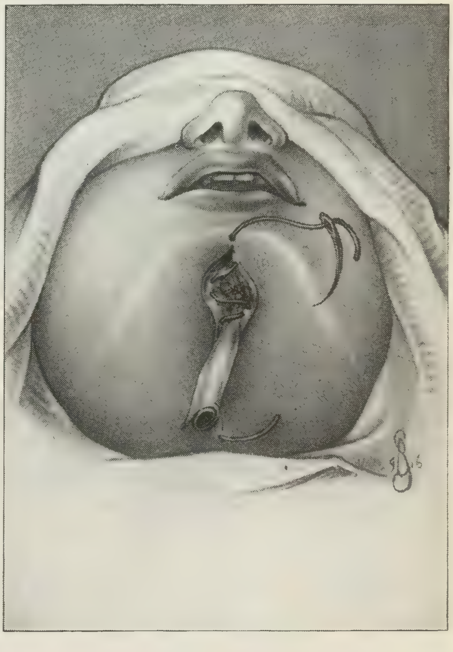
Tumor being drawn from its bed. Showing retractors drawing the muscles apart.

FIG. 3.



Ligating the muscles in their normal position, after removal of tumor.

FIG. 4.



Showing drain placed in position and subcutaneous suture prepared to draw parts together.

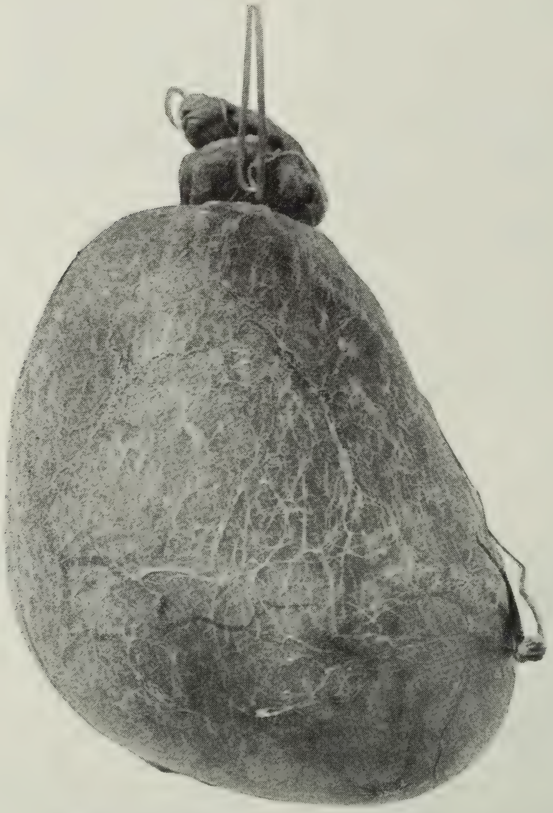
A very striking example of this is shown by the following case:

The patient, Mr. R., was twenty-four years of age, and by occupation a farmer. He was referred by Dr. F. A. Tate of Rice Lake, Wisconsin. There was a large swelling beneath the tongue. The patient had noticed a swelling in this region about eight years ago. It gave him little or no inconvenience until recently, when he experienced considerable difficulty in swallowing.

Examination. Within the oral cavity the swelling was so great that the patient's tongue, which was crowded into the pharynx, could not be seen. When the young man was asked to protrude his tongue the swelling would shift downward and project below the floor of the mouth close to the hyoid bone. At no time could the patient bring the tip of the tongue in contact with the anterior teeth. He talked with much difficulty, and his breathing was also much interfered with.

Mouth examination: Except for a slight gingivitis there was nothing to indicate any abnormality. The mucous membrane lining the oral cavity appeared normal. The teeth appeared free from caries, and the occlusion was normal. On palpating the floor of the mouth I could detect a doughy feeling within the mass, which itself was movable.

FIG. 5.



Showing dermoid cyst in its original size.

Physical condition. The patient had not been gaining in weight, and during the past several months had noticed that there was a marked loss in weight due to his inability to swallow solid food.

Past history. There was nothing to

indicate syphilis; the Wassermann test proved negative.

The patient was admitted to Trinity Hospital on June 26, 1916. The following morning, under ether anesthesia, an incision three inches in length was made through the skin, extending from the chin toward the hyoid bone. The muscles were separated by first making a small vertical incision between the genio-hyoid muscles and then separating them with retractors. The tongue was then grasped with tenaculum forceps and drawn forward. Pressure was brought to bear on the tongue, forcing the tumorous growth through the opening, as indicated in Fig. 1.

The mass was drawn gently out, while the operator, with the index finger, peeled away the soft tissues surrounding it. (See Fig. 2.)

This blunt dissection revealed the fact that the mass was attached between the genio-hyoglossi muscles, from which it was freed by dissection. The muscles were then brought into normal position and were held so with a buried catgut suture, and the opening through the skin was closed with a subcutaneous suture. (See Figs. 3 and 4.)

The patient recovered rapidly and was discharged one week later.

A laboratory examination of the mass (Fig. 5) proved it to be a dermoid cyst consisting of a fibrous capsule lined with stratified epithelium, and containing a soft cheesy material.

417 Wells Bldg.

The Steel Hypodermic Needle, and an Improved Method of Preventing Rust.

By J. L. ELPHINSTONE, D.D.S., L.D.S., Aberdeen, Scotland.

I HAVE previously shown (see Cosmos for May 1915) that the all-metal hypodermic syringe, Imperial pattern, may easily be adapted for sterilization by boiling in water, simply by replacing the leather packing with asbestos fiber and the leather washers with sheet tin.

The following method of preventing steel needles from rusting does away with the need of using sodium bicarbonate, and allows the syringe with steel needle to be sterilized by boiling in plain water.

For a time, shortly after the outbreak of the war, no nickel-coated steel needles of the Schimmel interchangeable pattern were procurable in this country (Great Britain), the only kind obtainable being of steel, without a coating of nickel. As these needles rusted very readily, a better method of rust prevention was sought. First, the protective film of liquid paraffin with which they are coated is wiped away, or it may be dissolved away with ether or chloroform or other solvent. The needles are afterward maintained in entire and constant contact with metallic zinc, except during the short intervals in which they are in actual use for making an injection, at which time part of the zinc is temporarily removed. The hub is lined with zinc, and after finishing the injection a tube of zinc is slipped over the free part of the needle as a cover.

Zinc is a metal which can be easily made into a tube on a drawplate.

The principle involved has long been in use in galvanized iron, in which the iron by means of a coat of zinc is protected against rust. In the electrolysis of water by means of an electro-couple of zinc and iron, the oxygen is attracted to the zinc, on which it exhausts its oxidizing action, while the inert hydrogen alone is attracted to the steel, on which it exerts no corrosive action. A certain amount of loosely adherent zinc is deposited on the steel where the two metals actually come in contact, as evidenced by the gray color which the steel assumes. I am unable to detect in actual practice any ill effect on the needle from this coating, and theoretically I also believe it to have no ill influence on the needle therapeutically. Doubtless, on first thought, many will say that if zinc is undesirable on culinary utensils it must be injurious on the hypodermic needle. I believe this reasoning to be faulty, and that a fairer analogy would be that if zinc oxid does not retard the healing of a wound, neither is the contact of this small quantity of metallic zinc, with some oxid, likely to injure the tissue punctured by the needle. Our food contains salts, acids, and alkalis which readily remove zinc from cooking utensils, and would tend to cause its eventual absorption through the food by way of the alimentary tract. On the needle the circumstances are not analogous. However, when the zinc is deposited in such amount as to become visible, the needle may be rubbed with a wooden point until it becomes bright again. Within the tubular cover of zinc may conveniently be placed one of the slender brass clearing-wires which are supplied with the needles. (See Fig. 1.) This wire should be attached within the tube by a particle of soft solder at one end, or the end of the tube and the wire may be nipped in the pliers so as to hold the wire firmly in the tube. This is a convenient way of keeping a clearing-wire, prevents it from bending, and brings the electric influence of the zinc into touch with the inside of the needle. (See Fig. 2.)

Fig. 1.

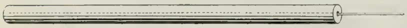


Fig. 2.

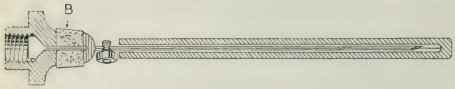


Fig. 3.

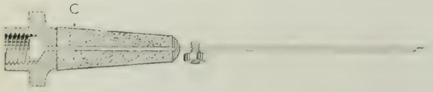


Fig. 4.

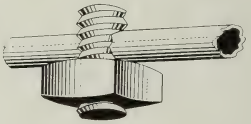
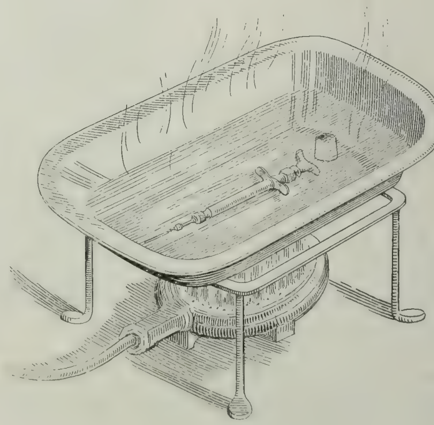


Fig. 5.



Skeleton hubs are used. The hubs B and C are cut away on one side and filed flat, leaving only the minimum unfiled portions at the point and base in order to support the needle. The round-pattern hub is more convenient for opening-up in this way than the hexagon pattern. In this manner the entire steel shaft of the needle is exposed for inspection, so that it may be rejected on the first sign of rust.

Next, a ribbon of sheet zinc is laid on the flat surface opened-up on the hub in such a position that it touches the needle but does not hide it. (See Fig. 3.) The sides of the ribbon can be bent back to clasp the hub, or it may be secured in any convenient manner. The zinc corrodes away in the water, but can be conveniently renewed when required after a time. The needle heads should be coned to 60°, and the insides of the hubs should be coned to correspond. The heads of most needles are rather square-shaped and do not seem to have been given any definite form. The apex of the coned head should even project through the base of the hub into view, so that this particularly critical spot may be examined for rust.

The coned heads will be found to hold more firmly than any other form on the market, are less liable to loosen from the shaft, and more readily produce a water-tight joint. If the heads are of this shape and are made of metal of suitable hardness, there is no necessity for a copper sheathing for the soft metal heads.

This method of preventing rust is specially valuable with the non-nickeled needles, but is equally suitable for the nickeled variety. The nickel coating is, however, no advantage

While unable to say how long a needle so protected will remain free from rust, theoretically it should last indefinitely. However, as an actual working plan they are renewed every Monday morning, after having been in frequent daily use all the previous week.

Sterilization is effected by boiling the syringe in an enameled dish in plain water without dismounting the needles. I also illustrate a convenient set-screw (Fig. 4), which is made from a piece of an old expansion arch, nickel-silver, as used in orthodontia. The needle is let through a perforation in the threaded wire, while a small piece of the nut is tightened hard against it; its purpose is to prevent a broken-off needle from getting lost in the tissues. This idea originated with Dr. Riethmüller.

Chronic Ranula.

By MILTON R. BOOKMAN, M.D., F.A.C.S., New York, N. Y.,
ADJUNCT ATTENDING SURGEON, LEBANON HOSPITAL, NEW YORK.

CYSTIC tumors of this character found in the floor of the mouth on either side of the median line are, pathologically speaking, inflammatory retention cysts of the sublingual mucous glands or submaxillary and sublingual salivary glands or of their ducts. According to Butlin, the name ranula should be reserved for a cystic dilatation of the mucous glands of Blandin-Nuhn, which are situated on the under surface of the tongue near the frenum, while false ranulæ are those cysts formed by an obstruction and subsequent dilatation of one of the smaller ducts of the submaxillary or sublingual salivary glands. These latter are by far the most common.

ETIOLOGY.

The causative factor in the production of these cysts appears to be an intraductal inflammation, giving rise to the formation of plugs of inspissated mucus which cause a retention of secretion and secondary cyst formation. The acini emptying into these obstructed ducts after a time undergo a species of pressure atrophy; this accounts for the slow growth of some of the chronic forms which have smooth and atrophic cyst walls. These mucous plugs may become calcified in the course of time and cause symptoms of intermittent obstruction, which, among others, is an important sign in the diagnosis of a salivary concrement.

The rôle that bacteria play in the etiology of these conditions is still problematical, although streptococci have been found in the ducts and cyst contents. Congenital ranulæ, while very rare, have been reported by Paget, Lannelongue, and others.

The sacs are very thin-walled, and covered in the floor of the mouth by mucous membrane; they are unilocular and the interior of the cavity is smooth and glistening. The majority of these cysts are entirely within the mouth, that is to say, above the mylo-hyoid muscle which, with its fellow of the opposite side, forms the floor of the oral cavity. Occasionally the cyst may arise from the deeper portion of a gland, and the posterior border of this muscle may cause a constriction in the sac, making it peanut-shaped. The lower pole may present under the ramus, and seem quite superficial in the neck, as well as protrude under the tongue. This was the condition found in one of our cases. The contents of the sac is a viscid, glairy mucus somewhat similar to smoky egg albumin.

Ranulæ as a whole are classified clinically as acute, intermittent, and chronic. The first two are as a rule associated with concretions and more rarely a foreign body, but as this paper is limited to the consideration of chronic ranulæ they will not be discussed.

Ranulæ are first noticed as small "lumps" under the mucous membrane of the floor of the mouth, gradually becoming larger and sometimes attaining the size of a small bantam's egg. Spontaneous rupture is not uncommon. The tongue is pushed upward and to one side as the sac grows, and chewing, swallowing, and phonation are interfered with, the patient usually seeking relief when these become annoying and when the cyst has reached the size of a large grape. The color is pearly pink, and to the touch they are rather immobile and tense.

The diagnosis presents but little difficulty except that rarely a thyroglossal cyst is found near the floor of the mouth above the hyoid bone, but the latter is always in the median line, while a ranula is to one side of it. A dermoid cyst in the glands may be confused with a ranula, but these teratomata are apt to have different areas of consistency when palpated. A nevus in the floor of the mouth is much softer, and it is usually possible to expel the blood from its vessels.

METHODS OF TREATMENT.

Various methods have been proposed for the relief of this distressing condition, among which are simple incision, incision with destruction of the lining membrane by carbolic acid, etc., introduction of a seton, aspiration and injection of irritants, ablation of the dome of the sac with cauterization of the remaining wall or suturing of its edges to the mucous membrane—and Mintz goes so far as to advocate an external incision and removal of both gland and ranula.

The simpler methods, aside from the predisposition to invite recurrence, often have the tendency to thicken the sac wall, and to create cicatricial tissue between it and the neighboring structures, rendering later measures for its relief even more difficult. The use of violent cauterizing agents to destroy the sac walls may cause a severe inflammation of the mouths of the remaining ducts, and so produce further trouble, as it is well-nigh impossible to limit the action of a foreign fluid in the mouth.

TECHNIQUE OF THE WRITER'S METHOD OF OPERATION.

The following procedure we have tried in a number of cases with good results, and have had no recurrences. The teeth are well flossed and cleaned for a few days before operation and a good mouthwash used. If the patient is nervous or apprehensive, a preliminary dose of morphin may be given, and if much deep dissection is expected this may be combined with a liberal addition of atropin to inhibit secretion. The patient is placed in a comfortable semi-recumbent position in a good light, and asked to roll the tongue backward and to the opposite side, which makes the tumor more prominent. The ranula is steadied with the gauze-covered finger, and novocain ¼ to ½ per cent. with adrenalin is injected just under the mucous membrane with a fine needle; this injection is made into a zone a trifle above the equator of the mass. The injection serves the double purpose of anesthetizing the area and separating the mucosa from the cyst wall. Aided by a fine mouse-toothed forceps, a circular incision is made into the mucous membrane, leaving a fairly large cap of it attached to the dome of the ranula. The best means for accomplishing this is the careful snipping of the edematous area with small curved scissors that have the points "true."

The cap of mucosa left at the summit is now grasped in an Allis forceps and slight traction exerted to lift the cyst from its bed. The dissection is continued, keeping close to the wall of the sac, and confining the snipping to the anterior and lateral aspects. Twisting the sac by means of the Allis forceps at the dome brings some of the fibrous strands into relief, upon cutting which the mobilization is rendered more easy. When most of the anterior and lateral aspects are freed the twisting is accentuated so as to bring the posterior surface laterally, which permits the attack on this usually difficult portion to be performed with more facility and directly under the eye.

The novocain solution is injected as the operation proceeds until nearly all of the cyst is freed from the surrounding tissue, and a small pedicle is formed; this usually contains the principal blood-vessels or pulls them free from the gland itself; and having had a few experiences in which distressing bleeding occurred, we now use a fine ligature, which is thrown about this pedicle and tied before the mass is ablated.

When the dissection is carried down well under the tongue or jaw the reaction is apt to be severe—salivation, edema of the floor of the mouth and tongue, pain and tenderness under the jaw with swelling, and some rise of temperature and pulse, attended by considerable malaise —all of which looks like incipient Ludwig's angina, but the persistent use of ice externally and generous use of mouth-washes will soon cause these alarming symptoms to subside. Following this the gland may be tender at mealtimes, but even this in the course of time disappears. The wound in the mouth is left to close by granulation, and kept clean by frequent washing. Diet should be fluid, and taken through a tube for the first few days, with a gradual return to normal.

Suture of the cut edges has no advantages, as the wound cannot be kept clean under these conditions, and as the sutures will usually cut through, nothing is gained; as a matter of fact the cut edges have a tendency to fall inward and adhere to the raw surface underneath, so that only a small uncovered surface remains that soon heals by granulation.

Of course in all cases it is not possible to utilize the foregoing technique in its entirety, but the removal of a large portion of the intra-oral part of the sac with the proper care of the rest will result in a cure. In the case mentioned in the first portion of this paper we attempted a complete removal, but after having freed what seemed to be the larger portion of the sac, the patient, a nervous young woman, ruptured the sac in the depths of the wound. The sac was then packed through the rent, and the portion that had been dissected free was removed. There was considerable reaction locally in this case, as the dissection had extended well under the ranine vessels, but with the removal of the packing on the following day the local condition cleared up rapidly. The opening in the floor of the mouth was kept well dilated until the lining of the sac united to the mucous membrane. The final result is excellent; no recurrence after more than a year.

473 E. 141ST ST.

The Efficiency of the Dentist Increased by Wearing Correct Glasses.

By J. A. KEARNEY, M.D., New York, N. Y.,
LECTURER ON OPHTHALMOLOGY, POLYCLINIC MEDICAL SCHOOL AND HOSPITAL, NEW YORK, N. Y.

A REVIEW of my case records of dentists I have refracted during the past eleven years leads me to believe that a citation of the summaries of their usual complaints when they apply for treatment, and results obtained by wearing correctly prescribed glasses, may be of interest to the dental profession generally.

The successful dentist must possess good vision. Every means to help him keep his vision accurate is an addition to his efficiency; and reversely, the conditions that tend to lessen this requisite lessen his efficiency.

In the modern dentist's office may be found various devices to make for increased efficiency. Among them are elaborate electric lamps to illuminate the field of operation, electric magnifying mirrors, electric dental engine with attachments, electric switchboard with attachments, and scores of other aids; but the above mentioned, while elaborate and expensive, seem to be essential to the up-to-date dental surgeon.

The dental practitioner who possesses all this elaborate armamentarium may not have sufficient vision to make out distinctly some of the details in his work that are necessary for him to see, and if he should manage to do so, he suffers headaches of various sorts, and tires before the end of his working day, which amounts to fatigue at times at the quitting-hour.

To sum up—(1) Visual defects with or without eye-strain symptoms, and (2) general complaints referable to eye-strain, are the usual disturbances that compel the dentist to apply for eye-treatment.

Those who have visual defects are unable to see distinctly in preparing tooth cavities, and cannot make out the root-canals even with the best illumination. Those who have general complaints referable to eye-strain usually suffer from frontal, temporal, or occipital headaches, eye-pain, eye-tire, general tire, and fatigue. My dental clients when they apply for treatment are either wearing glasses that require change or are not wearing any at all, and require them.

The usual correction that is prescribed is for compound hyperopic astigmatism, hyperopic astigmatism, hyperopia, mixed astigmatism, in the order named; some for compound myopic astigmatism, myopic astigmatism, and myopia, while a few have required the addition of a prism for extrinsic muscular imbalance. When the estimation of the refraction is made, glasses are prescribed of a strength decided upon to correct the error in the individual case and to give more comfort.

The usual report after the wearing of glasses for a time is the clearing-up of the visual defects and symptoms referable to asthenopia—eye-strain—and through these the capacity to do more work and of a better character—this necessarily following.

Again, various other disorders, vertigo, insomnia, mental depression, melancholia, flatulent dyspepsia, indigestion, and constipation have been benefited, and in many instances have disappeared entirely.

There are others, again, who have always had good vision and have never complained of symptoms referable to eye-strain, but who have reached their fortieth year or over and suddenly discover that they cannot see the details within the mouth as distinctly as usual—presbyopia. For these, lenses of sufficient strength are ordered to enable them to see distinctly and comfortably at the distance from which they usually work.

Glasses should be changed just as soon as the vision is not sufficiently accurate, or when eye-strain symptoms such as headaches, eye-aches, and unusual tire or fatigue are noticed.

127 West 58th st.

Extraction of Impacted Third Molars.

By ISIDORE CLIFFORD, L.D.S., R.C.S.Eng., London, Eng.

THE subject that I am here presenting for consideration is one that I believe will be of interest to all dentists—viz, some methods adapted to simplify the extraction of impacted lower third molars. I believe them to be new.

Years ago I approached these operations with great trepidation—and feel convinced that numbers of other dentists at present do the same—but now I undertake them with confidence. First I take a radiograph—this is an absolute necessity—so as to know exactly what obstacles have to be overcome, and also the correct direction from which to apply pressure upon the tooth so that it can be elevated.

Fig. 1.

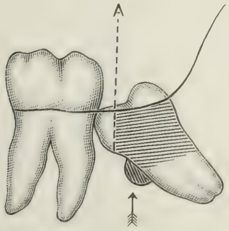
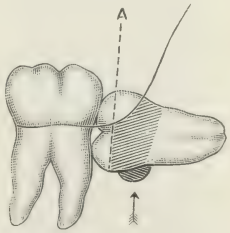


Fig. 2.



In such cases, where the tooth is erupting in its normal direction but is unable to take up its proper position in consequence of lack of room, my method is as follows:

First the mouth is carefully sterilized, and then with a sterilized, pointed cross-cut fissure bur in the dental engine, the alveolar process is cut away *between the second and third molars;* in other words, make a hole where the elevator is to go. Over the third molar an incision is made in the gum from behind forward down to the bone or crown of the tooth. The elevator can then be easily placed in its right position, and up until now I have found little difficulty in raising the tooth previous to removing it.

When, however, the tooth is not growing normally, but, as so many do, with the cusps of the crown pressing hori-

FIG. 3.

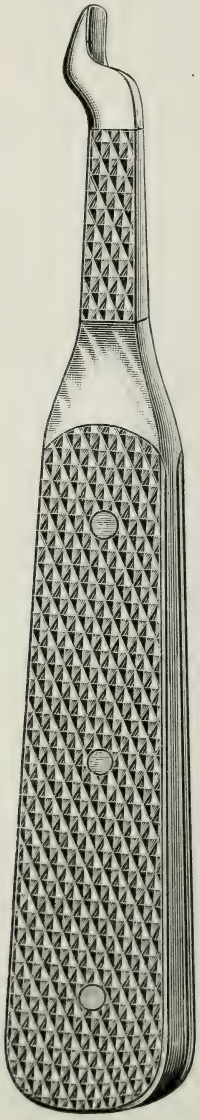


FIG. 4.

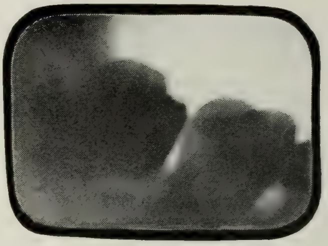
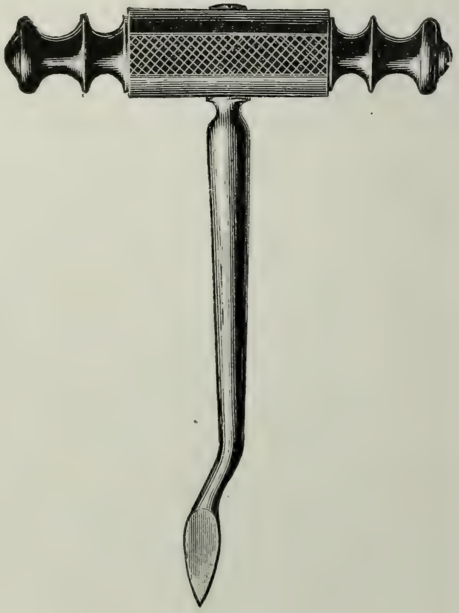


FIG. 5.



zontally forward into the distal portion of the second molar—for example, in such cases as where formerly it was sometimes advisable or necessary to extract the second molar before the third molar could be removed with safety—the methods are different. In this class of cases, if the cusps have forced their way into the second molar, as often happens, or in the event of its cusps pressing with such force against the second molar as to make its elevation difficult, a thin vulcarbo wheel is used to cut a slice from the third molar to overcome this trouble, and then the pointed cross-cut fissure bur is used, as mentioned before; not, however, in the alveolus between the third and second molars, but on its labial side, as marked in Figs. 1 and 2. Then make the incision in the gum as before. For these cases a special elevator is used (Fig. 3) which is placed at the point indicated by the arrow in Figs. 1 and 2. This elevator does not necessitate employing the root of the second molar as a fulcrum, but instead the dense bone beneath the tooth is used. On pushing the elevator in where the alveolus has been removed, its point goes first down the side of the third molar and then slides underneath the tooth and presses it upward in the direction of the least resistance, which in this case it finds for itself. (See Figs. 1 and 2.) I find that with this instrument I am able to remove teeth which a few years ago I should have had the greatest difficulty in extracting.

The advantages of these methods are that they obviate entirely the difficulty of forcing the elevator into its exact position, and also, it seems to me, prevent the possibility of breaking the tooth.

The necessity for taking a radiograph is shown in Fig. 4. When this case first presented itself, to all appearances the third molar was aligned with the second molar, but it was found that the crown was built up deceptively with a large amalgam filling. Anyone attempting to extract this tooth in the ordinary way, with an elevator or forceps, would probably have broken off the crown, but thanks to the radiograph I was able to determine the fact that the roots were lying horizontally. I therefore drilled *underneath* the root and also horizontally; then, using a Lecluse elevator (Fig. 5) placed well underneath the tooth, by turning the elevator I raised the tooth easily and quickly. I was prepared for a long operation, but this took only a minute or so.

Details could be given of many similar cases, but these are probably sufficient to explain the methods. Anyone who has to operate for impacted third molars will appreciate the advantage of clearing away the bone *before* inserting the elevator, and perhaps, like myself, wonder why he did not think of it before.

20 GROSVENOR ST., W.

The History of Dentistry and Dental Bibliography as a Subject of Teaching and Research, with a Plea for the Establishment of an Index Dentalis.

By B. W. WEINBERGER, D.D.S., New York, N. Y.,
LIBRARIAN FIRST DISTRICT DENTAL SOCIETY OF THE STATE OF NEW YORK.

"AS MAN has an ever-recurring proneness to make himself the standard of the truth—to condemn, sneer at, and despise all that he does not choose or is unable to comprehend, so in a greater degree every generation of men admires its own wisdom, skill, science, art and progress; it calls its own whatever it has learnt from men of former days, and counts the few improvements which have had their birth in its own time as triumphs and distinctions which elevate it above the past. If we consider the history of the ages gone by, these high pretensions will soon abate somewhat of their confidence. The progress of those contrivances toward our comfort which we sum up in the term civilization has been very creeping and laborious."(1)

In the light of modern progress it is interesting to note that the practitioner of today believes he is doing something heretofore never practiced, yet we find that dentistry, both as an art and science, has its place in the earliest medical treatises.

It must be admitted that we often

overlook the obvious fact that every professional man, consciously or unconsciously, bases his conceptions and their application on those of his predecessors, and that whenever we acknowledge this indebtedness we are to a certain extent using the historical method, for it is fundamentally unimportant whether our predecessors lived two or two hundred years ago.

The significance of the work of a profession and its true value and position with regard to humanity is first made clear to us through history. Only after we have reviewed the labors of thousands of years and have seen how our science has advanced can we appreciate the work of the individual and the part he has played. "Much arises which has already perished, and what is now honored is already declining," is probably as true in dentistry as in medicine and other sciences.

In the December (1915) issue of the Dental Cosmos we find the following editorial comment:

> We have on previous occasions endeavored to direct the attention of our readers to the tendency to repetition of ideas and the rediscovery of truths related to our professional work so constantly manifested in our periodical literature, and to no small degree in our standard literature as well. We seem to be constantly re-threshing the yearly intellectual product and extracting therefrom a grist of truth which, although for the uninitiated it may present the outward superficial appearances of the newly born, is nevertheless the "lean and slippered pantaloon" of ancient effort exploiting itself in infant guise for the edification of the ignorant. We have not only directed attention to the abovementioned tendency, but have endeavored to show that it represents a vast bulk of misdirected energy, and what is of much greater importance, it constitutes a formidable obstacle to dental progress—that kind of progress which is the collective result of the intellectual growth and practical efficiency of the individuals composing the dental profession. . . Attention is again directed to these matters in the hope that it may stimulate a habit of study of the literature of a subject by the investigator before he rushes into print with his report and his direct or implied claim to originality, and incidentally relieve the stress upon our magazines arising out of the continuous demand for space for the publication of papers which at the best are but re-statements, and too often very imperfect re-statements, of ideas and truths already abundantly recorded in our literature.

How best can this be accomplished? In this country no definite place in the scheme of dental education has yet been assigned to the study of the history or bibliography of our art and science, nor has any great amount of work been done, or any definite system been inaugurated and carried out, in compiling a bibliography of dental literature.

The question as to whether the time has arrived for teaching history and bibliography in our schools cannot be answered in a general way, but with the establishment of the four-year course I believe it has come for certain institutions, and the remainder will follow when the fundamental principles are once established and a start is made. A few schools now include the study of the history of dentistry in their curricula, but I believe none of them instruct their students in bibliographic technique or search.

History is constantly teaching the lawyer, the statesman, and the physician; why not the dentist, who practices an important branch of the healing art? The introduction of postgraduate classes, the lengthening of the course to four years, and the raising of the preliminary requirements in the dental colleges show that the need of broader culture among dentists is recognized. That the medical profession has seen the advisability and recognized the advantage of historical knowledge and the historical method in its curriculum is indicated by the courses given in this subject in the various universities, and by the number of historical sections in local medical societies and colleges.

That interest in historical subjects is on the increase among dentists hardly needs demonstration. Not many years ago a historical consideration of a dental subject was practically unheard of, but now occasionally we see articles appearing in the various journals which give evidence of the fact that a great deal of thought is being given to the subject. During the past year there have appeared in our dental journals historical articles by Drs. Kirk, Prinz, Thorpe, Cigrand, Koch, and others.

THE STUDY OF HISTORY AN IMPORTANT FEATURE OF MEDICAL EDUCATION.

The value of medical history as a desirable feature of medical education has been strongly emphasized by the late Dr. John Shaw Billings, founder of the *Index Medicus* and the Index Catalog of the library of the Surgeon-general's office. The valuable work he did in the upbuilding of a higher literary medical standard in this country is now only beginning to be appreciated.

Dr. A. C. Klebs, in the *Bulletin of the Johns Hopkins Hospital* 1914,(2) has said of Dr. Billings, "Not being, nor wishing to be, a historian of medicine in the technical sense of the term, although having done fine work in this as in many other fields, he [Billings] used the inspirations and the lessons of that history, which he mastered as few have done, for the solution of the problems before him. The enormous share he has had in the upbuilding of a higher medical education in this country will only be fully appreciated when his quiet activity has become better known. The study of the history of medicine and its promotion as a distinct feature of medical education he frequently recommended."

Dr. Billings, in an address before the Medical and Chirurgical Faculty of the State of Maryland in 1883, urged the cultivation of medical history: "Doctors and surgeons would do well to keep historical books on their shelves, and might without prejudice to their professional capacity read something else besides manuals and text-books. It is to be hoped that the scheme of higher medical education which your university is about to organize will include instruction in bibliographical and historical methods as well as those of the laboratory and clinic."(3)

History primarily demands facts which have to be sought for. Dentistry is fortunate in having a number of good histories that give to the student a comprehensive view of the history of our science. First among these is Guerini's "History of Dentistry." This masterpiece of historical synthesis, brought out under the auspices of the National Dental Association, with the co-operation of Drs. Kirk and Charles McManus, has failed to arouse the expected interest of the dental profession, and on account of the lack of financial support only the first part of this work has been published. This only strengthens my contention that to arouse proper appreciation of such work the foundation must be laid in the dental schools. Another work worthy of mention and brought out in this country is that of the late Dr. Chas. R. E. Koch, "History of Dental Surgery," by various authors, in three volumes. There is also the work in German, "Geschichte der Zahnheilkunde," by Geist-Jacobi.(4)

Instruction in the history and literature of dentistry is certainly of the greatest value, "not only as a means of general culture, in teaching students how to think," but from a purely practical point of view, in teaching them how to use the implements of their profession to the best advantage. That this is effectively promoted by historical knowledge and the historical method is recognized by many. While an acquaintance with the literature of dentistry is of great importance to the educated dentist, it forms but a part of the desired knowledge; the balance must be obtained by a deeper study of the historical evolution of our art and science through bibliographic technique.

IMPORTANCE OF DENTAL JOURNAL INDEXES.

The importance of a journal index is so widely recognized and the lack of it so frequently deplored that no argument in its favor seems necessary. There is, however, too little appreciation on the part of publishers and editors of the value of good indexing. It is remarkable, in view of the manifest usefulness of good indexes, how many books and journals there are which are not provided with indexes, and how many more are provided with indexes that are inaccurate, insufficient, and unreliable.

There is no branch of indexing more important at present than that of the dental journals, and unfortunately but few are indexed completely or according to a rational plan. It is gratifying, however, to note that there is at present a marked tendency to reform in this direction. It is also gratifying to know that dentistry possesses one instance of journal indexing that can and should be used as a guide to all others. Since the establishment of the DENTAL COSMOS this has been one of its prominent features, and it can be truthfully said that its index could hardly be improved upon. How much better off the other journals would be, and how much more useful and accessible would they be to the profession in general if they had adopted this feature from the beginning.

Many of our dental journals have been shortlived, the total number having decreased, so that at present there are 120 current journals. Of these 37 are published in this country, of which 10 are college journals; 20 are published in Great Britian, 3 of which are college journals; 4 in Austro-Hungary; 7 in France; 6 in Germany; 3 in Italy; 2 in Japan; 3 in Portugal; 3 in Russia; 5 in the Scandinavian countries; 15 in Spain and Spanish countries, and 3 in Switzerland. Since the establishment of the *American Journal of Dental Science* in 1839, there have been published some three hundred dental journals, of which only about one-third are now in existence. The greatest decrease has been in this country, where ninety-three have discontinued publication.

BIBLIOGRAPHIC TECHNIQUE.

A majority of dental articles review or depend largely upon previous writings. It is within the province of bibliography to indicate both to the writer and to the reader the sources from which this information comes. Bibliography is of importance in that it retains in permanent form a record of the authorities used, and "should be the key opening the way to the required information; it should afford a means of getting before the reader the right article in the least time."

Experience has shown that bibliographic references should contain the complete and correct answers to the questions: Who wrote the book or article? What is it about? When and where published? A reference to a book or journal article should consist of (1) the author's name and initials; (2) title of the book or article; (3) if a book, the edition, other than the first; if a journal, the title of the periodical in which the article is found; (4) place of publication and date of issue; (5) if a journal, the volume or series of volume, and (6) the pages covered by the article. The title should be in *italic* or UPPER-CASE type so as to distinguish the title from the other data.

The author's name identifies the workman. The bibliography is an author index on the material referred to, and helps the reader in finding articles that indexes have omitted or that are too recent to have been included in any other index.

The title identifies the paper itself, especially when the author has written much on the subject, and defines the scope of the paper without further search.

The place of publication, and in case of a book the name of the publisher, is of aid in identifying a publication.

The date of a book, journal, pamphlet, or other printed matter should be placed next to the name of the author, as it is the most important fact in scientific bibliography. It establishes the worth of the work as to its chronology and therefore its position when questions of priority arise. The date is a point from which to work in finding other articles later or earlier, and furnishes a clue to the scope of the paper.

The volume number reduces the quest to a single book, and in most cases to a single sequence of pages. This is no small item in the case of a journal that publishes several volumes a year.

The page number directs the reader immediately to the article sought, while inclusive paging gives him in advance an idea as to the length of the article. When given, the page reference obviates the use of the index, which may be absent, or useless, or omit the entry one seeks.

It is no part of my present purpose to set forth more than the method and principles of bibliography. Considerations of the various methods and principles used are to be found in a number of excellent treatises already published.(5) (6) (7)

INDEX DENTALIS.

When a dentist has observed or thinks he has discovered something new, or some new fact, or has evolved a theory that he presumes to be original and wishes to investigate the subject, more often than not he is at loss to know where to begin, even when a large dental or medical library is accessible for the purpose.

The information he desires may be in a volume within his reach, but how is he to know that? Even when the subject catalog is placed before him he finds difficulty in its use, especially, as is often the case, when he has but a vague notion as to what it is he wishes to look for.

It is only when he begins to write a paper that he finds how utterly incompetent he is in looking up references. For that reason instruction with regard to the preparation of the bibliography of the literature of dentistry in the future should form no small part in the course of dental education. In the absence of some instruction of this kind the student is likely to waste valuable time in bibliographic search.

The medical profession is far in advance of the dental profession in regard to this matter. The former already has two important works of reference, namely, the Index Catalog of the Library of the Surgeon-general's Office,(8) and the *Index Medicus,*(9) a monthly publication covering the whole field of medicine and including a part of dentistry. Is this not the time for the National Dental Association or the National Association of Dental Faculties to seriously consider an Index Dentalis?

Germany is far in advance of other countries in the matter of indexing dental literature. Professor Port of Heidelberg, Germany, has already brought out three immense volumes of dental bibliography, a careful analysis of which will reveal the wonderful amount of work he has already accomplished. In this country Dr. Arthur Black and Dr. A. Weber of Havana, Cuba, have worked along this line for years, but so far as I know, nothing has been published. I can personally appreciate the enormity of this task, for my own small index on Orthodontia, from three hundred volumes of journals published since 1800, contains so far fourteen volumes of nearly eight hundred references each. This is but a branch of dentistry, and indicates the stupendous undertaking we have before us; nevertheless sooner or later a beginning should be made.

LIBRARIES.

That there has been a general awakening and an increased interest among dentists in historical subjects and dental literature is again shown by the establishment of many new as well as improvement of the old dental libraries. When the time comes, and that I believe is not far distant, when the schools shall include courses in both of the subjects mentioned in the title of my paper, it will be necessary to have well-established dental libraries in every large center of the country. These cannot be built in a day or in a few years, consequently concerted action by state and local societies is necessary immediately, in order to make such libraries of value to the profession. The so-called dental libraries in the numerous dental schools, which contain but a few odd journals and old textbooks, should be improved until they are worthy of the name *library.*

CONCLUSIONS.

(1) Historical study, as well as that of bibliography, will exert a most beneficial influence on the student, school, and dentistry in general, if made an integral part in the scheme of dental education.

(2) If dentistry is to advance and keep pace with medicine, if postgraduate courses and research work in dentistry are to amount to much, then an Index Dentalis similar to the *Index Medicus* must be established.

(3) New dental libraries should be established and the old ones improved.

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40 E. 41st st.

CORRESPONDENCE

Taking Impressions: Materials and Methods.

To the Editor of the Dental Cosmos:

Sir,—Regarding the taking of dental impressions, materials and methods, it is a pleasure to me to know from several articles I have read that Prof. Geo. H. Wilson sees the fallacy of the Greene and Supplee methods in the great majority of cases—either through the inability of the patient to co-operate with the dentist, or more often the dentist's inability to follow the prescribed technique with any regularity.

The great majority of dentists depend upon the laboratory man to finish the case; and to one who has had experience in the commercial laboratories and knows the way in which work is rushed through and handled in its different stages by men competent and youngsters incompetent, the matter assumes the form of a joke.

It is truly wonderful when, under such conditions, the average dentist gets a really successful denture for a patient, and it is more a matter of luck than due to any material or method he may have used in taking the impression, so called. Imagine if you can the result of taking a bridge impression (inlay bridge) in modeling compound as advocated by a certain very successful bridge workman, and then turning it over to the commercial laboratory to be finished! The laboratory is blamed, of course, for the resulting lack of adaptation.

I cling to the idea taught by the late

Prof. Grant Molyneaux, *i.e.* "The more difficult the impression, the more need to use plaster of Paris." I think Professor Molyneaux' method of preparing the tray with wax, doing any so-called muscle trimming and also muscle or tissue displacement for esthetic reasons, or to secure a more even bearing, is a method hard to improve upon. When the tray is so prepared, an impression in plaster of Paris properly mixed and manipulated will give more nearly uniform success than the more complicated methods suggested by Greene and Supplee, except perhaps in rare cases.

The truth is, the great majority of dental graduates have during their college life "side-stepped" as much of prosthetic dentistry as they could, and have not even an idea of what a true dental impression should be. This being true, how do they expect to master one of the most difficult operations that we as dentists have to deal with, by such complicated and exacting methods as are laid down by those who advocate the exclusive use of modeling compound?

Dr. Wilson has certainly proposed three pertinent questions, viz:

(1) Why do you exclusively adopt modeling compound?

(2) Do you believe every dentist can manipulate compound successfully?

(3) Do you know there is much unconscious deception in impression taking with compound?

Question No. 3 is the most pertinent.

Respectfully yours,

D. D. Cornell, D.D.S.,
Formerly Prof. Prosthetic Dentistry,
Ohio Coll. Dental Surgery.

Des Moines, Iowa.

"The Naval Dental Service as a Career"—A Correction.

To the Editor of the Dental Cosmos:

Sir,—In your issue for January I am credited with a misstatement on page 83, 2d column, in the paragraph at 5th line. My carbon copy is as follows: "The navy provides ready-made a life plan for you. For so many years you are a lieutenant, junior grade. Then you are a full lieutenant, and consecutively a lieutenant-commander, commander, captain, rear-admiral," *et seq.* This refers to all officers EXCEPT the dentist, who cannot advance beyond the grade of lieutenant-commander. In this manner he is unjustly discriminated against, and will continue to be until the dental profession secures equal recognition from Congress for the dentists with the medical and other officers.

J. D. Halleck, D.D.S.

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

New Jersey State Dental Society.

Forty-sixth Annual Convention, held at Asbury Park, N. J., July 12 to 15, 1916.

WEDNESDAY—*Morning Session.*

THE forty-sixth annual meeting of the New Jersey State Dental Society was called to order on Wednesday, July 12, 1916, at 10 A.M., in Cooper's Auditorium, Asbury Park, by the president, Dr. Henry Fowler, Harrison.

Rev. Dr. RICHARDS, Asbury Park, invoked divine blessings on the deliberations of the society.

The President then introduced to the society Mr. PANCOAST, who represented the mayor, Hon. C. E. F. Hetrick, and who welcomed the society to the city of Asbury Park on behalf of the mayor and the citizens.

The first order of business was the roll-call.

Dr. W. H. GELSTON moved that the calling of the roll be dispensed with, and the secretary be instructed to record a quorum present. (Motion carried.)

The next order of business was the reading of the minutes of the previous annual meeting.

Dr. R. S. HOPKINS moved that the reading of the minutes be dispensed with, and the minutes as published in the Transactions be adopted as the minutes of the last year's meeting. (Motion carried.)

Dr. J. I. Woolverton, Trenton, having been called to the chair, the president, Dr. HENRY FOWLER, read his annual address, as follows:

President's Address.

By DR. HENRY FOWLER, Harrison, N. J.

Pursuant to a custom of many years' standing, it becomes my privilege and duty, as president of the New Jersey State Dental Society, to bring before its members at this time such suggestions as seem advisable; to point out weaknesses, if any, in our organization, and to urge the adoption of such changes or broadened activity as appear to me to be necessary in order that the New Jersey State Dental Society may continue, as in the past, to be the foremost dental society in the world.

REORGANIZATION.

In surveying the events of the year bearing upon the progress of dentistry in this state, the successful reorganization of the New Jersey State Dental Society stands out the most important. A campaign which started at the 1907 convention at the suggestion of the late Dr. Chas. A. Meeker, but which later lost his support, has finally culminated in complete reorganization as originally planned.

The local, state, and National societies, now being merged into one organization, are harmonized in an effort for the betterment of dentistry both as related to patient and dentist. There are at the present time fourteen local societies within the state, as follows:

County dental societies: Atlantic, Southern, Ocean, Monmouth, Mercer, Middlesex, Union, Plainfield, Tri-County, Passaic, Bergen, Hudson.

Other societies: Clinical Club of New Jersey, Central Dental Association of Northern New Jersey.

Each society is paramount within the district assigned to it; that is, no man can become a member of the state or National society except through a local society; should it be impossible for him to reach a local society he may, with the consent of the Board of Trustees, join the State Society direct, thus placing the responsibility of selection as a member upon the society which admits him.

The advantages gained by this reorganization need not be recited here. Suffice it to point out as proof of the increased strength of co-operative effort the passage of the dental law of 1915, and the recent defeat of the pernicious attempt to foist party politics upon the State Board of Registration and Examination in Dentistry. Neither the snap of the party whip by the Governor nor the threat of loss of executive patronage were able to overthrow in the minds of the legislators the arguments that were presented by a strong, united profession.

It would indeed be strange if there were no criticism or fault to be found in the working of the constitution and by-laws as adopted under the reorganization plan. While in the main they have proved all that was desired and expected, yet as we enter upon the second year it seems advisable that a slight change be made in the manner in which amendments may be adopted, also the manner of selecting chairmen for the important committees having in charge the work of preparing the annual conventions. Therefore I recommend that all proposed amendments shall be in the hands of the secretary before March 1st, and that the secretary shall be authorized to send copies of such proposed amendments to all members through the officers of each local society, or direct, prior to March 20th, thus enabling a proper study and consideration of the proposed changes by all members before the annual convention, at which time they shall be adopted or rejected in the prescribed manner.

I recommend that the appointment of the chairmen of the Essay, Exhibit, and Clinic committees be not confined to the members of the Board of Trustees, as is now mandatory.

DENTAL LEGISLATION.

The subject of dental legislation is one of intense interest, and one which involves many and varied difficulties. Every state in the Union is endeavoring to improve on that which has gone before, in an effort to meet the changed conditions which are constantly arising. In our own state the new law, known as the dental law of 1915, represents among other things an endeavor on the part of the dental profession to protect the welfare of the public by raising the standard of efficiency, simplifying procedure against illegal practitioners, and creating a fund by annual license fees which enables the prosecution of all such infractions of the law.

The public have a right to know who is a licensed practitioner of dentistry, and the dental law of 1915 makes it possible to get this information.

Many things could be said about improved conditions in dentistry of the state under the new law, about which I need not go into detail at this time: suffice it to say that no other state of the Union has a dental law which protects the public and profession any better than that of New Jersey.

The passage, subsequent to the dental law of 1915, of an enabling bill which had for its purpose the granting of a right to certain individuals who were in school at the time of the enactment of the law raising the standard of preliminary education to all those taking examination for dental license, even though their requirements did not reach the standard of the new law, has been interpreted by the Attorney-general's office as destroying to some extent those requirements in the law of 1915; therefore I recommend that the Legislative Committee be instructed to draft a bill which will restore the high standard contemplated in the dental law of 1915, and that they be instructed to use every endeavor to secure its passage at the next term of the legislature.

BOARD OF REGISTRATION AND EXAMINATION.

I regret very much to announce that Governor Fielder has seen fit, up to the present time, to disobey the law which became effective by his signature as governor, in refusing to appoint to the Board of Registration and Examination in Dentistry the men selected by this society at the convention of 1915.

We feel that this has been a grave mistake on his part, and are justified in this belief by the many years of unqualified success this procedure has brought about both to the public and dentist in eliminating party politics from this nonpolitical educational examining board; also by certain events which transpired at the recent term of the legislature, whereat pernicious legislation was attempted.

I wish to call special attention to the report which will be submitted by the Board of Registration and Examination. In it will be found a *résumé* of the effect of prosecutions of illegal practitioners and the successful working of the dental law of 1915. The board is deserving of the highest commendation and support of every dental practitioner in the state in its effort to maintain the high standard so earnestly desired by all.

ORAL HYGIENE AND DENTAL CLINICS.

The important matters of Oral Hygiene and dental clinics for school children have made marked progress during the year throughout the state. A number of new school dental clinics have been inaugurated, and more oral hygiene lectures have been given by members of the society than ever heretofore in the same period of time. For a detailed account of the work being conducted along these lines I recommend a careful study of the report to be submitted by the chairman of the Oral Hygiene Committee.

Inasmuch as preventive dentistry and prophylaxis are the dominant factors in the minds of all leaders in dental thought calculated to bring about the maximum good to the public generally, I strongly urge that the New Jersey State Dental Society publish for general distribution a booklet attractively illustrated, having a text which will explain in language free from technicalities the importance of mouth cleanliness, the care of temporary teeth, the time of their eruption and loss, a description of the permanent teeth and their care, irregularities, malocclusion, etc.; unsanitary and pathological conditions and their relation to general health, proper instructions and manner of keeping the mouth clean and the teeth free from caries, and such other matters as may be deemed advisable. As a preliminary order, at least 100,000 copies of this booklet should be secured, which would furnish 100 copies to each member and leave a reserve supply to be disposed of as demand required.

To carry out the above, I urge that a committee of five be appointed to prepare such copy and material at the earliest possible moment for approval by the Board of Trustees, who should authorize its publication and control its distribution.

ARMY DENTAL CORPS.

Since the earliest days of American history no state in the Union has given birth to more strong, sturdy, and honest patriots than New Jersey; no place has been the home of truer patriotism. In the annals of New Jersey are many pages replete with the deeds of her sons and daughters, and on its verdant fields and blossoming hills, now for the main transformed into centers of progressive activity leading the world, many stirring and heroic events took place which led to the glorious victory marking the dawn of our nation. Since those momentous days and the more recent soul-racking times of '61–65, the men of New Jersey, in whose veins flowed the warm red blood of those worthy ancestors, heard the call of duty and responded, and once again were written the deeds of her sons in maintaining the ideals of life, liberty, and happiness—noble heritages to be kept sacred and passed on to future generations.

Within the past few weeks our sons and brothers have been put to the test. Uncle Sam has not found them wanting, and his call for them to rally to the support of "old glory" and the honor of the nation has met with unbounded enthusiasm and loyalty. They were ready to a man to do and dare for the defense of our country against the attacks of its enemies from whatever source. Throughout the breadth and length of the land "preparedness" has been the watchword, and our citizens have been fully aroused to the importance of this step for a successful maintenance of peace and liberty.

Read the glorious accounts of the work of American dentists in blood-stained Europe; realize the conditions of modern warfare, and appreciate the duty and obligation that our profession, highly skilled and trained as it is in our specialty, owes the community, state, and nation. Then let us prepare ourselves to take the place so vitally necessary in the general scheme of preparedness or defense. Let all those who will, send their names as volunteers to form an army dental corps, subject to call as needed, and let us place our equipment—such as may be of use—also subject to such call, thereby placing in line the dental profession of New Jersey ready to march in the footsteps of our forefathers in the defense of our homes, our state, and our nation.

I urge the appointment of a committee of five to carry out appropriate measures to meet the foregoing need.

RESEARCH.

Several years ago there was inaugurated by the National Dental Society a department for the purpose of carrying on a careful, scientific, and exhaustive study and research into all subjects having to do with the welfare of dentistry. This work has grown until it was found necessary to provide a permanent home for its officers, laboratories, and central organization, also the creation of a fund sufficiently large to enable the securing of specialists who could devote their entire time to the detail work of experimentation. This has entailed an enormous amount of work on those in charge, and some other source of funds became necessary as the work progressed. Just how these conditions have been met will be explained to you tomorrow evening. Some of our membership have contributed to this work individually, but the New Jersey State Dental Society has as yet taken no part in this great movement.

We shall have with us tomorrow evening Dr. Weston A. Price of Cleveland, Ohio, chairman of the Research Committee, and he will present to you in more or less detail the wonderful results accomplished, in order that you may know what is being done for dentistry, and arouse enthusiasm and a realization of the obligation that rests upon every dental practitioner to aid in the creation of this fund, which will permit a corps of specialists to further unravel the many unsolved problems that harass the life of a dentist.

I shall not go into the detail of what other states have done and are doing, because no doubt Dr. Price will cover this ground, but I do urge that the New Jersey State Dental Society contribute a sum sufficient to assist in this much-needed work, and at the same time join hands with the other states in maintaining American dentistry as the leader of all the world.

FIFTIETH ANNIVERSARY.

The convention to be held in 1920 will mark the fiftieth anniversary of the New

Jersey State Dental Society, and in order that the convention of that year may be worthy of the best effort, I recommend that a committee of five be appointed with full power to begin the preparation of the plan and to lay out the details, including the appointment of permanent committees, to the end that a sufficient amount of time and permanence of organization may be secured to stage a convention unparalleled in the history of New Jersey dentistry.

I recommend that this fiftieth anniversary of the New Jersey State Dental Society be commemorated by having all of its clinicians, essayists, and discussions by New Jersey practitioners.

THE "NEW JERSEY DENTAL JOURNAL."

We are proud of the work done by the staff of the *New Jersey Dental Journal* in promoting the welfare of dentistry in this state. The editor, Dr. Raymonde Albray, and his co-workers cannot be given too much praise for the good accomplished, and I urge upon the officers of each local society to aid in the work of the *Journal* by handing to the editor full reports of each meeting held, and all papers read before these meetings, for publication in the *Journal*.

A "FIELD DAY."

It has been suggested that the New Jersey State Dental Society arrange an annual "field day" of outdoor sports in the early summer, at which may be held tournaments in golf, tennis, baseball, running, jumping, trap-shooting, etc.—the idea being to make this an annual get-together meeting similar to the outings annually held by each local society in the spring.

I recommend that a committee of one from each of the local societies be appointed to report at the Friday morning meeting as to the advisability of this suggestion.

AN EXPRESSION OF THANKS.

In closing, I wish to express on behalf of the New Jersey State Dental Society and myself a deep appreciation of the hearty good will and co-operation manifested by exhibitors and their representatives in assisting so freely in efforts to produce in New Jersey a dental convention second to none.

Inasmuch as the dental profession and those engaged in supplying its needs are dependent to a very great extent one upon the other, we are glad to use every effort possible to bring into our relations cordiality, co-operation, and friendship leading to a closer and better relationship.

To the committees and their chairmen who have so earnestly labored in the production of this convention, the society owes many thanks, and I have no hesitation in saying that it will be given with a right good will.

On my own part I desire to express my thanks and deep gratitude to all officers, committees, and members who have so freely contributed their aid and advice in working for the welfare of dentistry in New Jersey. Never before has it been my privilege and pleasure to have been associated with men so free from selfishness and so wholly devoted to the interest and welfare of dentistry.

I had not intended to speak individually, because all have done their part so well, but to fail to recognize the great service of one would be to do an injustice; therefore it is with the greatest pleasure that I desire to call your attention to the work done in the interest of the society by its secretary, Dr. John C. Forsyth.

Dr. C. M. F. EGEL moved that a committee of five be appointed by the chair to consider the recommendations in the President's Address, and report to the society at a later session. (Motion carried.)

Dr. J. I. WOOLVERTON appointed as such committee Drs. Egel, Morris, Hopkins, Heazelton, and Shoemaker.

The President resumed the chair, and called for the report of the Committee on Necrology as the next order of business.

Dr. F. K. HEAZELTON, Trenton, presented the following report:

REPORT OF THE COMMITTEE ON NECROLOGY.

The Committee on Necrology reports three deaths during the past year, and submits the following resolutions:

Whereas, the membership of our society has been broken during the past year by the death of Dr. John L. Crater of Orange, Dr. William J. Reymar of Boonton, and Dr. Thomas L. Dobbins of Medford; and

Whereas, our deceased associates efficiently served their communities, and by lives spent in forwarding the ideals of our profession have increased the heritage left to younger members; and

Whereas, it is our desire, as a memorial, to record the deaths of co-workers in the interests of humanity; therefore be it

RESOLVED, That we, the members of the New Jersey State Dental Society, express an appreciation of loss in that our deceased members will not again meet with us in social or professional fellowship, and record our sympathy with the bereaved relatives; and be it further

RESOLVED, That these resolutions become a part of the minutes of this society, and a copy be sent to each of the families concerned.

F. K. HEAZELTON,
R. S. CLARKE,
A. L. BLAISDELL,
L. R. FRITTS,
M. C. PEARCE,
Committee.

Dr. HOPKINS moved the adoption of the report. (Motion carried.)

The next order of business was the report of the Oral Hygiene Committee, by Dr. J. B. STEVENS, Elizabeth, as follows:

REPORT OF ORAL HYGIENE COMMITTEE.

The results of the activities of your Oral Hygiene Committee have been gratifying indeed. The members of the committee have tried to point out in their work a fact that should be perfectly obvious to all, viz, that oral hygiene is a prime necessity. It seems strange indeed that we should take such pains to have our hospitals, instruments, hands, and bodies clean, and neglect the cleansing of the oral cavity. The principal object in safeguarding the cleanliness of food is that the products of digestion may enter the blood stream uncontaminated by organisms capable of producing disease. The fact that it might be polluted by an unclean mouth seems to have been overlooked to an alarming degree. To teach the people the function of the oral cavity and how to care for it should be our steady purpose and constant aim.

Without giving in detail the report of the work of the various members of the committee in the different districts, the committee wishes to present in condensed form a summary of the work done.

Dr. Wallace of Ocean, Dr. Mary Robinson of Camden, and Dr. S. G. J. Jackson of Vineland report progress. They have given a number of lectures on oral hygiene, and have endeavored to forward the work as much as possible, but have as yet been unable to establish clinics in their districts.

Dr. Joseph B. Goodall, Hackensack, Bergen County, reports as follows: "I have the honor to report for Bergen County that we have established a free dental clinic in the Hackensack hospital, are fully incorporated, and have been doing work since about January 1, 1916. At the dental clinic all children under sixteen years of age whose parents cannot afford the services of a dentist are cared for by the attending dentists. The clinic is open Tuesdays and Fridays from 2 to 5 P.M. There are ten attending dentists on the clinical staff, each one in attendance at an appointed time. We have from fifteen to thirty patients in the clinic on each of the days that the clinic is open. The dentists of Bergen County are planning for the coming year a more elaborate campaign of educational work along the lines of oral hygiene."

Dr. F. K. Heazelton of Mercer County reports that during the year the Mercer County Society has not conducted any public campaign in the interest of oral hygiene, but has done some very effective work in a quiet way. Dr. LeRoy Farley, the efficient and conscientious operator in charge of the city clinic, reports the following operations performed in the clinic for the year ending June 1, 1916: Extractions, 468; amalgam fillings, 886; cement fillings, 84; copper cement fillings, 227; artificial enamel fillings, 78; gutta-percha fillings, 31; pulp extractions, 85; linings and cappings, 206; root-canal fillings, 126; treatments, 1072; cleaning teeth, 240—making a total of 3502 operations. The clinic is operated eleven months in the year, five days each week, being open in the afternoons.

Dr. Charles Faupel of Hudson County reports that the oral hygiene committee of Hudson County delegated Dr. W. H. Bentley to give lectures to the public school children, and during the year he has given lectures in 53 schools, to 46,716 pupils, in the cities of Jersey City, North Bergen, Union Hill, West New York, West Hoboken, Hoboken, Bayonne, Harrison, Kearny, and Secaucus. "We have two free clinics to take care of the children who are unable to pay for dental services. Both are overcrowded, and we hope in the near future to increase the number of free dental clinics."

Dr. W. Burton Patrick of Orange reports as follows: "While the dental clinic has been in operation only since May 15th, still the work which has been accomplished fully demonstrates that its establishment has been of incalculable value to the pupils of this city, as is shown by the following: 320 cases have received attention by the dentist; 44 amalgam, 29 cement, and 8 gutta-percha fillings have been placed; 226 temporary and 52 permanent teeth were extracted; 110 pupils had their teeth cleaned, and 85 pupils received treatment for their teeth.

"In addition to the benefit which the individual pupil derives from the dental clinic, I am sure that its effects will be far-reaching in the matter of better attendance and the attention which pupils will give to the regular school work."

The Central Dental Association delegated the work of school lectures to Dr. Wm. Bentley, one of its members, and a man of great experience in this line. Under the supervision of Dr. R. A. Albray several lectures were given in the various hospitals by Drs. Albray, Kussy, Hopkins, Courrier, Talbot, and Wharton.

The Central Dental Association is planning for an Oral Hygiene week this fall, at which time lectures will be given in every school. The department stores will run display advertisements of dentifrices. Mention will be made from the pulpits, and the work will be advanced in every way. Dr. Ebersole will speak at the October meeting of the Central Dental Association to arouse enthusiasm on this subject.

Dr. J. R. K. Moody, Morris County, reports as here follows: Morris County has not been backward in the Oral Hygiene movement. Morristown has a free dental clinic, splendidly equipped for poor and worthy children under the age of sixteen, which has been doing a tremendous amount of good in the community. Children receiving treatment at the clinic have had the importance of oral hygiene well driven into their heads. Through the knowledge gained by the children, their parents and other families have had this matter brought to their attention in a striking manner. It has been found that many children whose parents could afford it, and who had never been to a dentist before, have gone to private dentists for treatment, showing the effect for good the clinic has had along this line. Every child at the clinic who is without a good tooth-brush is presented with one, and shown how to use it.

Numerous lectures have been given in the schoolrooms on the great importance of the care of the teeth and oral cavity. There have been several articles published in the newspapers. Our local society offered a prize of a two-dollar-and-a-half gold piece to the boy and girl writing the best paper on the teeth and their care. Several hundred children entered into this contest in a most enthusiastic manner. The papers of the winning boy and girl were published in the newspapers.

The Morristown free dental clinic is supported by private subscription, and is in operation every school day from 9 until 12 with a salaried operator and nurse in attendance. For any of the patients who want to help a little, there is a small bank on the table to receive contributions. The superintendent of schools is one of the trustees, and is very much impressed with the effect the clinic has had on the children in their school work. He has conducted a sale of sweet chocolate and peanuts on two different occasions, so that the children could have a part in helping to support the clinic. They canvassed the town pretty well soliciting orders, and as a result several hundred dollars were turned into the clinic treasury.

The new high-school building now in the course of construction is to include a suitable room for the operation of the dental clinic.

The clinic has been in operation 291 half-days since its opening in February 1915, and a report of its work is submitted herewith:

Sittings	1,730
Amalgam fillings	1,753
Cement fillings	254
Cleanings	347
Extractions	575
Abscesses	49
Root-fillings	167
Gutta-percha	52
Anesthetic used	29
Treatments and temporary fillings	447
Ascher's enamel fillings	7
Total operations	3,762

The committee from Union County reports: The clinic is in charge of Col. Wm. B. Martin, and run by his assistant, Dr. W. R. Osmun. Following is the synopsis of the report, which needs no comment:

Elizabeth Free Clinic. Report for the year—June 1, 1915, to June 1, 1916:

Patients	6,192
Cement and gutta-percha fillings	4,218
Amalgam fillings	2,079
Silicate fillings	279
Treatments	3,501
Extractions	3,719
Cleanings	1,267
Pulps extirpated	795
Total operations	15,858

Respectfully submitted,
J. B. Stevens, *Chairman.*

Dr. Hopkins moved that the report be received and made a matter of record. (Motion carried.)

Dr. C. G. Davis, chairman of the Entertainment Committee, reported that a smoker and dance had been provided for at the West End Hotel on Thursday evening at 9.30, and urged all the members and guests to be present at that time.

Dr. Hopkins moved that the election of officers for the ensuing year be made the special order of business for 11 o'clock Thursday morning. (Motion carried.)

Motion was then made and carried to adjourn until the Wednesday evening session.

Wednesday—*Evening Session.*

The meeting was called to order on Wednesday evening at 8 o'clock by the president, Dr. Henry Fowler.

The President then introduced to the society Dr. George Potts Olcott, Jr., M.D., New York City, who gave a lecture on the subject of "The Practical Application of Bacteriological and Serological Methods in Dentistry." (This paper is not published here for the reason that the MS. is not in the editor's hands.)

Dr. Olcott's lecture was discussed by Dr. W. A. Jaquette, Philadelphia, Dr. Joseph Kussy, Newark, Dr. A. R. Slade, Millville, and closed by Dr. Olcott.

The President then announced as the next item on the program for the evening a paper by Dr. Robin Adair, Atlanta, Ga., entitled "Common Sense Treatment of Our Pyorrhea Cases."

Dr. Adair's paper was discussed by Dr. W. H. Gelston, Camden, Dr. Edward L. Wharton, Newark, and closed by Dr. Adair.

Dr. Gelston moved that a vote of thanks from the society be extended to the essayists for the papers presented. (Motion carried.)

Motion was made and carried to adjourn until Thursday morning.

Thursday—*Morning Session.*

The meeting was called to order Thursday morning at 10.30 o'clock by the president, Dr. Fowler.

The President announced as the first order of business the report of the Board of Registration and Examination in Dentistry, which was presented by Dr. John C. Forsyth, Trenton, secretary of the board.

The next order of business was the report of a special committee authorized by the Board of Trustees to consider the matter of Group Insurance. Dr. W. F. Barry, chairman of the committee, reported as follows:

Report of Committee on Group Insurance.

The committee appointed by Dr. Fowler in reference to this insurance policy suggested to the society by Dr. Heatwole reports favorably after considering this policy in conjunction with the policy held at present by some local societies. We have compared this new policy with the old one, and we find several clauses in it that are more beneficial to the holders than the policy at present held. In this new policy, when a case of prosecution against a dentist comes up, the company gives the New Jersey State Society the privilege of passing on the evidence, while with the old company, they do not consult the society but merely go ahead as they see fit. There is also a clause in this new policy which covers not only the man insured but the assistants he may have in his office, and that is a particularly good feature of the policy in the opinion of the committee. Another feature of this new policy is that the insurance on the members of the society is in a blanket form, and when a man is expelled from the society his policy lapses, and consequently the State Society is in no way responsible for him in case he is expelled. Another feature is that the cost of the policy is less than the old one. If the company succeeds in getting 150 men from the society to take the insurance, the rate will be ten dollars a year, which is $2.50 less than the old policy. The committee wishes to recommend that the society take this matter up for action at this time.

Respectfully submitted,
WALTER F. BARRY, *Chairman.*

Dr. B. B. FILER. I move that the report be accepted and the recommendations adopted. (Motion carried.)

The secretary, Dr. Forsyth, then read a telegram of greetings from the president of the National Dental Association, inviting the members of the New Jersey Society to be present at the coming meeting of the National Association in Louisville, Ky.

Dr. S. I. CALLAHAN, Woodstown, on behalf of the society, presented to Dr. Albray a handsome gold watch as an expression of the esteem in which Dr. Albray is held by the members of the society, and also as an expression of appreciation of his splendid work in connection with the *New Jersey Dental Journal.*

ELECTION OF OFFICERS.

The next order of business was the election of officers for the ensuing year, which resulted as follows:

President—Dr. J. I. Woolverton, Trenton.
Vice-president—Dr. A. S. Burton, Asbury Park.
Secretary—Dr. John C. Forsyth, Trenton.
Treasurer—Dr. Charles F. Jones, Elizabeth.

Dr. E. R. MORRIS then presented to Dr. Forsyth a handsome gold watch as a slight token of the appreciation of the services of Dr. Forsyth to the society as its secretary.

Dr. W. G. HANRAHAN. I move that the secretary be instructed to cast one ballot for the four men who were selected last year to the Board of Registration and Examination, but whose election was not ratified by the Governor, to act in the same capacity as they were elected for last year. (The men referred to in the motion were Drs. C. F. A. Hane, C. M. Egel, R. S. Hopkins, and A. L. Westcott.) (Motion carried.)

Dr. Walter F. Barry was elected to the board to take the place of Dr. Truex, whose term expired this year.

Motion was then made and carried to adjourn until the evening session.

THURSDAY—*Evening Session.*

The meeting was called to order Thursday evening at 8 o'clock by the president, Dr. Fowler.

Dr. Fowler introduced as the speaker of the evening Dr. WESTON A. PRICE, Cleveland, Ohio, who gave a lecture entitled "Work of the Research Institute of the National Dental Association."

Dr. HOPKINS moved that a vote of thanks be extended to Dr. Price for his very interesting lecture. (Motion carried.)

Motion was then made and carried to adjourn until the Friday morning session.

FRIDAY—*Morning Session.*

The meeting was called to order by the president, Dr. Fowler, on Friday morning at 10 o'clock.

Dr. Fowler introduced as the speaker for the morning session Dr. T. O. HEAT-

WOLE, Baltimore, Md., who read a paper entitled "Report of Two Cases of Lung Abscess Caused by Dental Mishaps."

[This paper is printed in full at page 300 of the present issue of the COSMOS.]

DISCUSSION.

Dr. L. Biddle Duffield, Philadelphia. *Mr. President and members,*—After hearing this most commendable paper and the very good suggestions offered to those interested in operations about the mouth, especially extracting, there seems to be very little to be said. Viewed from the standpoint of the exodontist I would like to class the accidents referred to by the essayist under three headings: (1) Those which occur under the use of chloroform and ether, (2) those which occur under nitrous oxid and oxygen and somnoform, and (3) those which occur under a local anesthetic. We know that under chloroform and ether the patient is in a reclining position, and during the operation many times there is danger of the tooth itself or a fractured portion, perhaps, getting into the throat and becoming obscure, owing to the accumulation of saliva and blood. As the essayist suggested, we can protect the patient from danger by packing off the throat with gauze. In my work I use a four-ply gauze, four or five inches in length, and with this the throat can be packed off so as to prevent any foreign substance from getting into it. These pieces can be sterilized and again used, as they have been and are being used by a number of men throughout the country. In place of gauze some are using cotton or sponges, which seem to serve the purpose just as well. The greatest possibility of accidents seems to be under these two anesthetics—chloroform and ether. Under nitrous oxid and somnoform the patient is in a semi-reclining position, and the operator has some opportunity of getting anything out of the mouth before it gets into the throat. However, there is always the danger of an accident in these cases.

This brings us now to the field in which we are all working at the present time, that is, local or conductive anesthesia, a field that is bound to be larger than ever. Under local anesthesia the patient is conscious, and the injection of novocain makes it possible to perform an almost absolutely painless operation, the addition of suprarenin causing contraction of the capillaries and allowing very little hemorrhage. The patient is in a conscious state, and any accumulations that may get in the throat may easily be detected by him. This gives the operator a better opportunity of avoiding many of these accidents than any anesthetic we have had heretofore.

Dr. Walter F. Barry, Orange. When I was put on the program to discuss the paper I had no idea as to what I was to speak upon, but on receipt of the paper I was glad to see that it was upon this subject, which I think is so commonly neglected by the dental profession. I think most of us when we administer nitrous oxid for the extraction of one tooth often lose sight of the fact that we may possibly drop the tooth, or that it may spring from the forceps back into the throat. I think this paper will serve a very excellent purpose in warning us against the dangers which the essayist has brought out. I do not think we should attempt to give nitrous oxid and oxygen for the extraction of even a single tooth without first packing off the throat.

As Dr. Duffield and Dr. Heatwole brought out, the throat is commonly packed with gauze or some kind of sponge. I use a silk sponge, through which I thread a heavy cord to which is attached an iron ring. This can be thrown into the sterilizer and used from time to time. We hear frequently of mishaps to patients who have swallowed plates, but very seldom do we really have a case come under observation. Within the last month, at one of the hospitals with which I am connected, we had such a case. On Sunday afternoon I happened to go to the hospital to see a fracture case, and while I was there the ambulance came in with a man in an unconscious state. It was said by a member of the family who gave the history of the case to the intern that the man had swallowed his artificial denture about noon, which was followed by convulsions, one about every five minutes, until at that time the patient was unconscious. We learned from the intern that the family physician was called in, and had attempted to remove the plate from the esophagus, having worked at it for an hour and a half. The intern himself had tried for some time to remove the plate, and then, learning that I was in the hospital, he called me. The man was having convulsions every five or ten minutes, and we naturally thought that the convulsions were due to the fact that he had swallowed the denture. We tried to feel it from the external surface, and what we thought was the plate was the hyoid bone. The man was unconscious all the time. He had a large mouth and few teeth, and I succeeded in getting my hand pretty far back in his throat, so far in fact that I really thought I could feel the plate, but as a matter of fact I felt only the cartilage of the hyoid bone. We worked for some time in the operating-room without success, so that we decided to anesthetize the patient, although he was unconscious during our efforts. The man was put on the table and anesthetized. His position on the table, which was raised at one end about six inches, was with the head extending over its edge, and thrown back so that we could get a straight line of vision down the throat with the bronchoscope, with the aid of which we removed the plate.

The plate had been swallowed about noon, and it was eight o'clock that night before we succeeded in removing it. The patient had had the plate in the esophagus so long that it had become embedded, and was very difficult to remove. We could see the denture quite a while before it was removed. I found it necessary to turn it before removing it. I might add that it was a partial plate with six teeth and had several sharp edges, and was so much embedded in the tissues that we could only see a corner. We finally succeeded in turning it and lacerated the esophagus to some extent in removing the plate. During the operation we learned from the family physician that the man's convulsions were not due to the fact that he had swallowed the plate, but were due to uremia. I may say that after we removed the plate the patient was sent home, and died two days afterward from pneumonia. I have here the instruments we used for the operation and shall be glad to have the members examine them, and to explain the uses of the various intruments to anyone interested.

In closing, I wish to thank the essayist for bringing this matter before the society, as I think it is of great value to the profession at large.

Dr. Heatwole (closing the discussion). There is little to say in the way of closing the discussion. It is gratifying to me to be with you on this occasion, and to have had my paper so well received. I am glad also to have had the advantage of the discussion which followed. Dr. Barry's case particularly is very interesting, and it is doubtless true that many such cases might be traced out and put on record, if we made any effort to do so. In the preparation of my paper, when speaking to professional men about what was being attempted, it was surprising to have so many say that it would be possible to get other cases to report by consulting various physicians. It was not my purpose, however, to make the paper a lengthy one, so I did not care to include too many.

I felt that some good might come out of a discussion of the subject, although it at times may be embarrassing to review such matters in detail. It is to be hoped that such recitals may prove of special benefit to the younger men of the profession, who may not yet have had a wide experience, and my earnest wish is that they may be spared such disagreeable incidents in future practice.

Dr. Gelston moved that the society extend a vote of thanks to Dr. Heatwole for his very interesting and able paper. (Motion carried.)

The next order of business was the installation of the newly elected officers, after which the society adjourned until the next annual meeting.

Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York.

Union Meeting, held at Buffalo, N. Y., November 23, 24, and 25, 1916.

A UNION meeting of the Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York was held in Buffalo, November 23, 24, and 25, 1916.

The meeting was called to order in the German-American Hall, at 11.10 A.M. on Thursday, November 23d, by Dr. M. Burton Eshleman, president of the Eighth District Dental Society.

Dr. Eshleman introduced Dr. FRANCIS E. FRONCZAK, health commissioner of Buffalo, who delivered an address of welcome.

Addresses were made by Dr. ROBERT MURRAY, Buffalo, president of the New York State Dental Society, and Dr. JOHN B. HOWE, president of the Sixth District Dental Society.

The session adjourned at 11.35 A.M.

THURSDAY—*Afternoon Session.*

The meeting was called to order at 2.30 P.M. by Dr. Eshleman, who introduced Dr. E. R. Webb, president of the Fifth District Dental Society. Dr. Webb made a short address.

Dr. Webb then took the chair, and introduced as the essayist of the afternoon Dr. W. E. CUMMER of Toronto, who presented a paper entitled "Partial Dentures."*

Dr. Cummer's paper was discussed by Drs. J. Wright Beach, Buffalo, A. P. Burkhart, Auburn, Abram Hoffman, Buffalo, and G. B. Beach, Syracuse.

The meeting then adjourned until the evening session.

THURSDAY—*Evening Session.*

The meeting was called to order at 8 P.M. by Dr. John J. Scott, president of the Seventh District Society. Dr. Scott introduced Mr. Guy B. Webster of Chicago, who addressed the meeting on the subject of the Dentists' Mutual Protective Alliance, outlining in brief the purposes and objects of this new organization—namely, the defense of dentists who are prosecuted for the infringement of process patents.

Dr. Frank W. Low, Buffalo. I have a resolution that I want to offer regarding this matter:

> *Whereas*, we, the Fifth, Sixth, Seventh, and Eighth District Dental Societies of the State of New York are regularly assembled; and
>
> *Whereas*, the Buffalo and Rochester City Societies have indorsed the Dentists' Mutual Protective Alliance; and
>
> *Whereas*, we here today have heard the plan and objects of the Alliance outlined; therefore be it
>
> RESOLVED, That we most heartily indorse the Alliance and recommend all dentists to co-operate with it, as we see and recognize a national necessity for an organization of this character in our profession.

It was moved and seconded that the resolution be adopted. (Motion carried.)

The essayist of the evening, Dr. RUSSELL W. BUNTING of Ann Arbor, Mich., was then introduced, and read a paper entitled "Preventive Dentistry."

[This paper is printed in full at page 257 of the present issue of the COSMOS.]

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* This paper is not published here for the reason that it has already been published in the March 1916 issue of *Oral Health*.—ED.

DISCUSSION.

Dr. Daniel H. Squire, Buffalo. In opening the discussion on Dr. Bunting's paper, I wish to call attention to his clear and concise *résumé* of what has been done in preventive dentistry thus far. We are to be congratulated upon having so able a man to review the vast amount of literature which has been written upon this subject, and to present it to us with so definite a statement of what is to be done in order that we may measure up to a higher and more scientific standard of practice in maintaining bodily health.

The propaganda of oral hygiene and the prevention of decay is not new, for we read in dental history that the attention of the laity has been directed toward the value of a clean mouth for centuries. Giovanni, an eminent man of his time, wrote several canons upon this subject to be followed throughout the daily routine of life, as follows:

(A) Hard substances should be avoided.

(B) Things too hot or too cold should not be eaten.

(C) Things which set the teeth on edge should be stricken from the daily diet.

(D) That vomiting should be avoided.

(E) That leeks should not be eaten.

(F) That the teeth should be brushed with the end of a stick.

(G) That the mouth should be rinsed with an aromatic decoction.

(H) That the teeth should be brushed with powder after the last meal of the day.

This is not such a bad system of oral hygiene when one considers that it was promulgated over four hundred years ago.

It is not my intention to discuss each valuable point that has been mentioned in this paper relative to preventive dentistry, because in the first place I do not feel that it is fair to the other discussers, and secondly, in view of the array of experts who are to follow me, I should simply expose my own ignorance. Therefore I am going to confine my discussion to the possible foci of infection which are left in the mouth as a result of operative measures.

It has been said that three-fourths of all cases of peridental disease among people who visit the dentist with a fair degree of regularity are due to a lack of proper consideration for the gingivæ in our operations. This is a serious charge, but it was made by a man who does not jump at conclusions, and who came to this belief after keeping careful tabulation upon operative work. Are we not responsible, then, for the greater share of mouth infection? Personally I feel that this is true.

Dr. Bunting's statement that the skin and the mucous membrane are nature's barriers against the ingress of bacteria should impress us with our duty more than ever. We were not taught in college, years ago, very much about the importance of the soft dental tissues, but, on the other hand, we were instructed in the latest technique in placing beautiful fillings, crowns and bridges, and, in fact, to do any constructive work upon the crowns of the teeth, and there the teaching seemed to terminate. Therefore it has been extremely difficult for us older practitioners to avoid lacerating this important membrane in our endeavor to restore tooth forms. Such injury was considered simply an incident accompanying the operation, for we had not been told of the far-reaching effects from the laceration of the gingivæ, and we were not in the strictest sense responsible. But now, when we are shown conclusively that not only such injuries are dangerous to bodily health, but that large metallic fillings in the interproximal spaces, ill-fitting crowns, open contacts, lack of contour, and too extensive separation of the teeth are a menace as well, it is time for us to realize the gravity of the situation. The only conclusion to be reached, therefore, is that the general practitioner must change his methods of technique, so that the septal tissues will be conserved, as well as those upon which his energies are directed. While the gum is to some extent a specialized tissue, yet we must not lose sight of the fact that it has a function to perform, and is of the greatest importance in prolonging the usefulness of the teeth; also that some of the fibers of the peridental membrane are inserted into its fibrous mat and hold the gingivæ against the surfaces of the teeth, and that when we injure or destroy the gum in the interproximal space or elsewhere, we also destroy that portion of the peridental membrane. Nature has provided a free margin of gum tissue under the protection of which some fillings may be laid. If in the adjustment of clamps, ligatures, and separators, or in the finishing of fillings with strips, disks, or files, we cut and lacerate these tissues we have opened up an avenue of infection; and it has been my experience that when these fibers have been torn from their attachment, the tissue absorbs and draws away at this point and does not heal, but rather remains as a raw surface, so to speak, indefinitely. This is also true when fillings are not properly finished.

Another important item in the operative work is the closing up of all open spaces between the teeth. These have been mentioned in the paper, and I wish to emphasize the fact that there is a difference, from a practical point of view, between a passive contact point and an active one. The former will allow floss silk to pass through it without any resistance to speak of, while the latter will resist the silk so that it passes by the points of contact with a snap. Again, the passive contact is made many times without separating the teeth, and is not so efficient, as it does not protect the gum, while the active contact will part the food at the point of contact and allow it to glide down the inclined planes of the gum tissue rather than into the interproximal space.

I have read that the conservation of the third molar is desirable because of its position in the angle of the jaw, as it acts as a wedge in keeping the other teeth in contact. However, open contacts due to separation or extraction of teeth should be remedied. One often observes an open space caused by early tooth extraction allowed to remain until it is nearly closed by the movement of the teeth on each side of the space. The space perhaps is too small for an artificial tooth, yet it should be closed by making exaggerated contacts of gold upon the surfaces of the approximating teeth. When a tooth is inclined from its normal position the force of attrition is no longer in the line of its long axis, but it is a misdirected stress against its attachment, and in time literally drives it out of the jaw. Therefore, if we would conserve the peridental membrane and the service of the tooth, it should either be moved to its former place in the jaw or braced in its present position.

The cutting of cavity walls well into the embrasures will do much to conserve tooth structure by preventing recurrent decay. This, however, should be governed by the conditions which are presented at the time of the examination, because many times there may exist in the mouth a period of immunity from decay, and extreme extension of this kind is not needed, but in any event the attachment of the gum should not be cut in extending the cavity rootwise; if the decay has already encroached upon the tissue, that is another matter.

The only method to follow which will show us the good or bad results from our work, and one which will raise the standard of our work immeasurably, is the one which was presented by Dr. Arthur D. Black some time ago, in which he recommended making a record of the conditions of the hard and soft dental tissues at the initial examination, and noting later the effect of the operative work upon the health of the gums and mucous membrane. Dr. Black has proved beyond doubt that the interdependence of these two tissues is paramount in the conservation of the organs of mastication, and this is the point I have endeavored in a very disconnected way to discuss.

Dr. John B. West, Elmira. It has been a great privilege to listen to this paper by Dr. Bunting, because I feel it is one of the most important subjects ever brought before a dental gathering. When I heard his paper I could not help being impressed with the thought that if we had given as much attention to preventive dentistry as to repairing the extensive ravages of dental diseases, we should be farther on the road to making life enjoyable, and people would have less dental disease than they have today. Discussion is merely for an exchange of ideas, and every individual who has given thought and study to a particular subject must have formulated ideas along the line he has been pursuing. I am sorry that my discussion must be more or less rambling, but Dr. Bunting has covered the whole realm of pathology as applied to dentistry, and we can only touch a few of the points that seem to us of greatest importance.

I was very glad that Dr. Squire referred to the danger to the peridental tissue from dental restorative work, and only wish to add one more thought along that line. We as dentists must change our technique and practice preventive medicine, as well as preventive dentistry, recognizing the fact that many cases of secondary systemic infection are traceable to the mouth as the primary focus.

I was quite surprised when Dr. Bunting was touching on the various things that might be used in preventing dental caries that he did not mention dietetics. I have been interested in following the work of Dr. Bunting at Ann Arbor, as well as that of Drs. Gies, Prinz, Wallace, and Pickerill. Each one of these men is very much in earnest, and each thinks the others are on the wrong tack; but I cannot help believing, regardless of the statements that Dr. Bunting has made in various papers, that as we come to understand better the science of nutrition, dietetics will play a big part in preventing dental caries. We know that salivary stimulants have a great deal to do with the increased flow of saliva, and Pickerill also states that they increase the alkalinity of the saliva. I believe that the diet does play an important part in forming the structure of the teeth before eruption. That is one thing which we must add to our dental curriculum, so that the men being graduated from our colleges may know how to advise parents and children in regard to what shall be eaten.

While I am on this subject, I might say I believe firmly that one thing which should be taught us as dentists, as we come out from various schools, is how to care for the teeth. This knowledge should not be left to be picked up afterward, and to be conveyed to us by manufacturing firms interested in spreading their different propagandas. Parents often ask us, "What kind of brush should be used in cleaning my children's teeth?" and very few times, I am afraid, do they get a truly scientific answer. It is a question to which but very few men have given much thought. Few can tell you whether you should use a dentifrice having an alkaline reaction or one having an acid reaction, and the arguments that some advance in favor of the kind they prefer are quite laughable. I have been practicing oral prophylaxis ever since my graduation. When I first commenced, I thought it was the panacea for nearly all human ills. You will find this view set forth in a paper of mine published in 1908.*

When we speak of preventive dentistry in its boadest sense, we must go back of the mechanical polishing of teeth. I cannot conceive that it is possible for us to scrape and polish all the teeth in the human race. In speaking of preventive dentistry, we should have the good of the whole human race at heart. There are great numbers of people who cannot come to us for prophylactic treatments, and it is up to us to find a way whereby, through dietetics, salivary stimulation, or any other means you please, we may be able to control dental caries to a greater extent than we do today.

Prophylaxis must be divided into stages. I do not think we can say that everybody must have oral prophylaxis. We realize that in early childhood most children are not troubled with peridental diseases, so that most of our attention should be given to preventing tooth decay, and we must become educated to the fact that it is almost criminal practice to go down under the gums of these little children when they do not need such treatment.

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* See DENTAL COSMOS for July 1908, p. 696.

In my opinion, more peridental disease is caused by the ordinary cleaning of the teeth with power polishers and pumice, thus destroying the gingival attachment of the first few fibers of the peridental membrane to the tooth, than we gain in removing débris and colonies of micro-organisms to prevent disease of the retaining structures of the teeth. Our prophylactic measures for children should be devoted to polishing the tooth surfaces above the gingival margin, employing the technique recommended by Dr. Bunting, in order to free the surfaces of mucoid plaques, thus rendering real benefit in preventing tooth decay for these little patients.

In adult patients, we should devote more of our attention to giving prophylactic treatments to the gingivæ and tooth surfaces under the free margin of the gum. It is in adult life that the resistance of the retaining structures of the teeth is lowered, thus producing more susceptibility to irritants. During this period of stress, by keeping the surfaces of the teeth under the free margin of the gum free of calculi and masses of micro-organisms, we prevent the progressive inflammation of the peridental tissues, raise their resistance, and secure immunity to peridental disease for many years.

Dr. W. W. Smith, Rochester. We hear so many extravagant statements regarding the benefits to be derived from prophylactic treatment as we understand it today, and also so many extravagant statements regarding the grave systemic effects of mouth conditions that are without any scientific foundation, that we are becoming rather skeptical concerning the matter; not that I would discourage taking proper care of these conditions, because many of them are pathological. The paper which Dr. Bunting has presented tonight, however, is so comprehensive, so sane, and so conservative, that it is to me very refreshing.

It seems to me that one of the important things we have before us today is the matter of obtaining normal conditions, especially normal occlusion. I think that we, as general practitioners of dentistry, have not yet come to really comprehend the importance of the work of the orthodontist and the oral surgeon in restoring the mouth to normal conditions.

How are we going to take care of the masses of the people? The well-to-do can afford to have this work done, but the masses of the people cannot, and yet it is one of the most important questions before us today. We hope the new dispensary in Rochester, which has been made possible by the gift of Mr. Eastman, as mentioned by the essayist, may accomplish a great deal along this line. The donor expects the co-operation of dentistry. Provision is made for doing research and scientific work, and it is the duty of dentists to do this work. The dentists of Rochester and its vicinity desire the co-operation of the dentists of the state and of the world in this work.

I was much pleased with what Dr. West said about prophylaxis and "scraping" teeth. I think we have to go back farther than this. All this was implied in Dr. Bunting's paper.

Then comes the matter of restoring normal conditions in badly broken-down carious teeth in diseased mouths. The plan proposed by the essayist is ideal, but I think few of us carry it out to its full extent. I mean absolute restoration to perfectly normal occlusion. We should do this as far as possible.

The question of supplying artificial substitutes for the teeth is a matter on which I might, perhaps, differ with Dr. Bunting to some extent. It seems to me that in supplying artificial substitutes we frequently defeat the object of the prophylactic work we are doing, because in many mouths the conditions are such that it is impossible to obtain a sanitary condition when these substitutes are used; and it is a question in my mind whether it is not better in many cases to do without the masticating surface they furnish than to run the risk of the deleterious effect on the peridental membrane by placing in the mouth a substitute that prevents maintenance of a sanitary condition.

In regard to the matter of prophylaxis, it is my delight to be able to differ with Dr. Bunting here. I was afraid I would not find anything in his paper to disagree with, but I have found something that I am positive in my opinion about. Dr. Bunting is also positive in his opinion, because he repeated his statement. He said that every operator who is conscientious toward his patients attempts to remove all tartar and food material, but that this service is not prophylaxis, being more properly known as cleaning teeth. That is where I differ with him. I do not see why it is not a prophylactic measure to remove the cause of future disease, and do it periodically if necessary. I do not see why we should call this cleaning teeth, and call the other preventive measures prophylaxis.

The general practitioner has a rather serious problem to deal with, it seems to me. I think all here, even Dr. West, agree that it is important to do prophylactic work, if you please to call it such, or, as Dr. Bunting would say, cleaning the teeth of patients. I think we all do less of this, however, as we grow older and have more experience. We have learned to teach our patients to keep their mouths in a cleanly condition, and so have less of it to do. Nevertheless, I am not able to so teach my patients that many of them will keep their mouths in a clean and healthy condition; a busy dentist cannot do much of this himself.

Now as to the education of dental hygienists. They are receiving a broad education and good training. The limitations which the laws of this state provide protect the public and the dental profession, and I believe dental hygienists will fill an important place in our institutions and in dental offices, if they practice under the supervision of a thorough and conscientious dentist who realizes the importance of this work.

As to the matter of the toothbrush, that is a question on which we disagree more than on anything else. I cannot but differ with Dr. Bunting on that subject. He says that we should not use a hard, stiff brush. I cannot understand why a soft brush should be used in cleaning the teeth. It seems to me you do not accomplish with such a brush the object for which it is used. To my mind, it is better, with proper precautions, and under proper instructions, to use a brush with firm bristles, except in rare cases, but I am open to conviction. It is unfortunate that we cannot have more uniformity in our methods of instructing patients. The practice of condemning to our patients all dentists who differ with us, telling them that ours is the only method, is confusing to them and creates a distrust which is conducive to harm both to the patient and the dental profession.

The habit of rinsing the mouth is very important. Dr. Bunting did not touch on this. By teaching the patient to take a small amount of water in the mouth and force it between the teeth, one can get as much force as by means of a spray or atomizer, and do just as much good. My patients are instructed to continue this rinsing for some time, after brushing, and it seems to me that it is important.

Dr. James T. Ivory, Binghamton. The ideal that Dr. Bunting has placed before us is, I am sure, not so far above what many of us are trying to do. The time has long gone by when the average dentist or general practitioner can "pooh-pooh" the idea of oral prophylaxis and the things that constitute mouth hygiene. If we could see patients as often as we should like to, and were allowed to do for them, when they come, the things we should like to, there would not be one-tenth of the trouble that we now have to correct; but they are human, and come to us only when in trouble, so that there is not much chance for prophylaxis alone. I think preventive dentistry should go a little farther than has been mentioned tonight. We should see that all our work is done in a better and more thorough manner.

Dr. West had quite a little to say about dietetics and about finding some means whereby the dentist would not need to see the patients in order to correct their troubles, and Dr. Bunting spoke about the thorough mastication of food. I am not sure that we should not get behind Fletcher, and say that people should use their teeth more. The most perfect teeth are in the mouths of people who *have* to chew their food, because it is not served in such a condition so that it fairly "slides down" without effort.

Speaking of the means by which we can assist nature in the prevention of dental disease, Dr. Bunting divided the work into three groups. The first, of which Dr. Smith has just spoken, was, measures by which the teeth may attain full development and be in normal relation with each other. We should begin with the children, but unfortunately we cannot do it all ourselves. We must see that our public schools teach prophylaxis and the care of the teeth to the children, and that the mothers and the medical profession are made to more fully realize what this care should be, and its importance in the development of the race. We ought to have some definite means of telling what they should do, and not have one of us advocating one thing and another something else.

Regarding orthodontia and the treatment of abscessed teeth of children, I think that is a place where we fail pretty generally. We do not see the children sufficiently early to do the work necessary to prevent these troubles, and very often when we do see them, we let them go without either doing it or telling their parents what should be done in the way of fillings, extractions, and orthodontia work. This is particularly true of the care of abscessed teeth. We are too apt to allow them to remain in the mouth, particularly in young children. If there is anything in the sepsis theory we should see that these children, who are just developing the framework that will decide their condition later, have such teeth removed.

The second consideration that Dr. Bunting spoke of, the restorations we should make and the work we should do on these patients in restoring their tissues to normal, is the phase of our work where we have the greatest field for preventing trouble; and that is another place, too, where we are deficient. He spoke of patients being sent to us by medical men. When we get these patients, we examine them thoroughly, and do our best to correct the conditions that we find, but very often we let others pass out of our offices who are just as much in need of attention without doing anything to aid them. Why? Because they do not complain and we do not like to hurt our own or our brother dentist's feelings by telling the patient how bad or dangerous work present in the mouth may be. We should be just as thorough when we do not know that a medical man is watching to see what is being done. We should extract more teeth than we do, or find a better method of treatment than we have now.

Regarding the third division of the subject, I thoroughly agree with Dr. Smith that if you clean the teeth—regardless of what you call it—and *keep* them clean, you are doing a great deal of good; but I am also inclined to think that we do more good when we polish the gingival surfaces with an orangewood stick, as the teeth remain in better condition for a longer time.

Dr. F. W. Low, Buffalo. I have never read anything indited by the pen of Dr. Bunting that was not deeply interesting. I never hear him speak but I feel the charm of his personal magnetism and of the perfect lucidity with which he impresses his ideas upon his listeners. Today has been no exception to previous experiences. I am in thorough accord with the essential deductions contained in this essay.

In one unessential statement I am inclined to the opinion that I have discovered the cart before the horse, and even upon that conclusion the going may be as swift whether the cart precedes the horse or the horse precedes the cart. Dr. Bunting seems to depend upon parents for the proper care of the teeth of their children, while my experience is, that a child who has been thoroughly inoculated with the oral hygiene idea in the public school is the most efficient proselyting agent, often converting the parents at home to a belief in more thorough and efficient oral hygiene, and so it turns out that the child is the horse.

Regarding that disease which bears so many names but with only one eventual termination, namely, the ultimate exfoliation of otherwise sound teeth, Dr. Bunting says, "Pyorrhea and peridental diseases almost invariably begin as inflammation of the gingival tissues." I have found in families where the elders are experiencing a flow of pus about the necks of the teeth, where pockets of various depths exist and teeth are loosening, or where atrophy of gum and alveolus render the cementum bare, that the juniors are suffering more or less from hypertrophy of the gum, and that bleeding, often unprovoked, is more or less a symptom of what is sure to follow. To counteract these symptoms, as a remedy looking hopefully toward immunity, I have employed the ethyl borate spray, administered by the use of the apparatus invented and sold by Dr. Dunlop of New York, which method of treatment I came to use in consequence of the admirable presentation brought to our attention several years ago by A. Hopewell-Smith, then of London, England, but now a professor in the dental department of the University of Pennsylvania. If employed at the very inception of the pyorrheal manifestations I find this treatment a most efficacious immunizing agent, and that it is an excellent palliative remedy even in the more advanced stages of such troubles.

In discussing "immunity from decay" Dr. Bunting says that in all types of mouths where the surfaces of the teeth are continually cleansed by the force of mastication we may expect to find immunity, and that such conditions are materially influenced by the mastication necessitated in eating the tougher and harder foods; but our foods so served are not so generally relished or sought after. I find that vigorous massage of the oral tissues following meals may be substituted for the coarser foods. Upon the recommendation of Dr. L. M. Waugh, some four or five years ago I began the habit of vigorously rubbing my gum surface with the index finger, which was shod with the so-called Indexo toothbrush. I commenced by alternating with the bristle brush, but gradually came more and more to rely on the rubber cot on my finger, until now I have given up the bristle brush entirely. Before commencing this practice the use of the brush caused more or less hemorrhage, but now there is not the least sign of blood following the use of the rubber cot, and I can assure you that after its use the oral cavity is in a glow of health, and most satisfactorily comfortable. The sensation is much the same as that experienced after a cold needle-bath. This method, supplemented by the use of the Cutter flat floss drawn in and out between approximal spaces, keeps all my teeth free from decay and firmly fixed. I am the sachem of my tribe; I shall never see sixty-six again, and I am the only member of the family not afflicted with loose and more or less carious teeth.

I advise my patients to buy a glass dome containing a big spool of this floss instead of purchasing the little spools of twisted floss usually sold at the stores. The twisted floss fails to gather up and remove particles of food crowded between the teeth with any degree of efficiency as compared to the flat untwisted floss. This is because the strands of the flat floss spread out on approximal surfaces, looking, when in operation, much like the hairs on a fiddle-bow.

Dr. Bunting's query, "May immune conditions be produced artificially in mouths which are naturally susceptible?" to me is a challenge very much like a red rag to the bull. Concerning the theory that sulfocyanate medication accomplishes at least some added degree of immunity, in reading my last paper on this subject before the Dental Society of Western Pennsylvania, and in its subsequent publication in the *Dental Summary* almost three years ago, I calculated that I had sung my swan-song, but a few things that I have learned since, together with my own purely empirical experience, now considerably augmented, makes me more than ever stanch in my contention that sulfocyanate medication is efficient for the purpose.

Dr. Bunting's significant statement, that "a general bodily health . . . . usually implies that the tissues of the mouth are well formed, well nourished, and resistant," is correct. This, coupled with the statement that freedom from a condition of abnormal viscosity of the saliva seems to be the chief factor for immunity, exactly coincides with my own opinions. If viscosity of the saliva is objectionable, and the administration by stomach of the sulfocyanate and hydrastis tablets materially lessens this condition, at the same time rendering the mucous tissues of the mouth generally more healthy, it seems to me that where superficial enamel decay is rampant such medication should help toward a condition of immunity.

Regarding conductivity and viscosity of mixed solvents, Harry C. Jones, professor of physical chemistry at Johns Hopkins University, has found that solutions of sulfocyanate render even water less viscid, and in one of his recently published papers Dr. Gies said that the bacteria found in superficial enamel decay were more acid and more active in plaque formation than those inhabiting the deeper dentin disintegration, and he has since intimated to me that his investigations concerning the effects of sulfocyanate stomachically administered proved conclusively that if the administration of the drug did no good it certainly did no harm, and that the final test of its efficiency must be empirical after all. It may be remembered that his tests regarding plaque formation in culture media flatly contradicted the findings of Dr. Waugh, chairman of the Committee on Scientific Research, whose investigations preceded those of Dr. Gies. Dr. Gies suggests as a solution of this discrepancy that while Dr. Waugh inoculated his cultures into one breed of dogs, Dr. Gies had undoubtedly employed for his inoculation a different breed. This opinion does away with one important objection to the theory that sulfocyanate may be a means to immunity; furthermore, since my previous swan-song did not prove fatal to me, I have ventured to sing this little addendum: If you do not do any good you will not do any harm. As a help toward immunity administer sulfocyanate and hydrastis.

Dr. J. O. McCall, Buffalo. This is a subject that interests me in personal practice, as well as from the standpoint of dentistry as a profession, and there are a few things that I want to say—one or two questions I wish to ask that may complicate the situation a little more.

One point I think we must keep in mind as an encouragement in any work we do of a preventive nature is the statement Dr. Bunting made regarding the results of prophylactic and other treatment in dentistry as compared to the results that the medical men are securing by their preventive work. They do not secure one hundred per cent. of results in prevention, and we cannot either; but that is no reason why we should not make as great an effort as they are making.

One other point is that immunity in the peridental tissues depends on two factors—freedom from irritating substances in contact with the gum and the maintenance of a fine quality of circulation in the gum tissue. That, of course, has been ably brought out by Dr. Low, and it would not be possible to impress it upon you any more strongly than he has done. There is no question that the more we can stimulate the circulation, the more patients will be able to ward off disease of these tissues. That is an important and practical point to bring up.

Another point is in regard to the giving of prophylactic treatment. I will leave it to Dr. Bunting to take up the issue with Dr. Smith with respect to the cleaning of teeth and the giving of prophylactic treatment. Yet we may, I think, all agree that the procedure generally understood as "prophylactic treatment" is not aimed simply at removal of débris, but is intended to stimulate the gum tissues. Possibly that point was not emphasized sufficiently. That is what we intend to accomplish when we use the orange-wood stick; it stimulates the circulation in the gums. This is one good reason for adopting that method for taking care of the mouths of our patients.

I will take issue with Dr. Bunting on one point, and that is on the use of a rubber instrument on the engine. I will of course agree with him that it is possible to polish properly certain tooth surfaces in that way, but the reason I do not use it, and the reason I do not believe anyone should use it, is because we cannot with that rubber cup reach all of the tooth surface that needs to be polished. Another point is, that if you employ the rubber cup you are apt to think you do not need anything else, because the surfaces polished with the rubber cup are seen, while the parts not polished with it are not visible. Therefore I cannot agree that the use of any polishing instrument on the engine constitutes prophylactic treatment. If the tooth surface has been properly prepared and the tartar all removed with our scaling instruments, we are as able to polish the tooth surfaces rapidly with the orange-wood stick and the broad silk tape as with any instrument that we can use in the engine.

Regarding the matter of immunity, this brings up a question for which at present there is no proper answer, but I wish to ask Dr. Bunting why it is that we have in a mouth teeth that are badly affected by caries, while in the same mouth there may be six lower anterior teeth that last throughout the patient's entire life without caries. That is outside the scope of the paper, but we must have it explained before we know what causes immunity in mouths that are not specially well cared-for.

Another question: Is is not possible that a good many infections are carried to the apices of the teeth not through the general circulation, as we often hold, but through the circulation in the peridental membrane? Do they not find their way to the apex more readily in teeth in which the peridental membrane is slightly inflamed? It is well known that we have inflammation beginning on the gum margin in which we can see a red area running along the root toward the apex. Not all of the peridental tissue has been destroyed, but it is already invaded by organisms. Is it not possible that we may prevent a good many periapical infections by avoiding infection of the gum margin? We notice many of these conditions on the apices of teeth that have been crowned or have been subjected to procedures that caused infection and inflammation of the peridental membrane.

There is also one thing I want to say in regard to a point not touched upon in Dr. Bunting's paper, which was brought out by Dr. West; that is, that the colleges and all of us are endeavoring to teach prophylactic treatment as something different from the cleaning of teeth. In the clinics we are endeavoring to teach the students not only the importance of avoiding injury to the gums, but how to improve their condition if irritation has already set in, and this is very important. I have the pleasure of doing a good deal of that teaching in the infirmary, and all of us there are endeavoring to improve the teaching in that respect. The colleges are not lagging behind in that direction, but it is not easy to teach all these things to the student. It is easier to teach him how to prepare a cavity and insert a filling than how he may detect places around the tooth where calculus has lodged, and to properly remove it. We are trying to impress this on the minds of the students so that they will carry it with them when they graduate, and improve their technique beyond what they are able to do while in college.

There is one other point that I want to speak of—the matter of uniformity in teaching the care of the mouth. I am a member of a small society composed of dentists interested in peridental infection and in oral prophylaxis, and this society may be said to represent fairly the men who are most active along these particular lines in the profession. We are taking steps to work out a method of brushing the teeth that will be acceptable to the profession at large. It will be presented to the profession, and we hope it may be adopted, so that we may be able to say to the patient, "This is a good method, which anyone can use with profit." Then we shall soon eliminate a serious difficulty in the way of the proper care of our patients' mouths.

Dr. A. G. Stiker, Addison. In some of our kindergartens they have a system by which they give the children three meals a day. I took up with the directress of one the subject of dietetics, and I found that what she did not know about dietetics would fill a book. I then took up the question with the teachers in the kindergartens, and found that they knew even less. I wish each one of you, for three successive nights, would eat one-eighth of a pound of chocolate candy on retiring; then try the same experiment with sour apples, and study the effect on your teeth. I wish you would have a breakfast of buckwheat cakes and coffee for three days, and then have one with oranges, and study the effect on your teeth. You will need no scientific demonstration. Dr. Arthur D. Black stated that one could, within twenty-four hours, produce tartar by means of diet alone, and could remove it within the same length of time in the same way. As an experiment, I have gone without using the tooth-brush for some time, and have kept my teeth clean by means of diet alone; I have also used the tooth-brush three times daily, and yet have had my mouth feel very unclean on account of the diet taken. I believe we should be able to produce literature to teach ourselves and the great mass of the people how they shall *live* so as to prevent such trouble with the teeth. One man cannot do it alone, for there are thousands of people to reach.

Dr. A. Hoffman, Buffalo. Considerable has been said by the essayist and those who discussed his paper about malocclusion of the teeth. If malocclusion plays such an important part in preventive dentistry, why is it that so many practitioners advise delay of orthodontic treatment until after dentition is completed?

Dr. Edward Schwartz, Buffalo. Why not have members of the dental society speak in the public schools, and teach the children what they should know about the effect of diet on the teeth? There is no reason why there could not be such a lecture in each school in the city once a year at least. The same with pyorrhea. Why not have a postgraduate course in the university, where all of us practitioners who desire it could go at least once or twice a week and hear pyorrhea discussed by the best men?

Dr. Bunting (closing the discussion). I have presented tonight the methods by which we may practice preventive dentistry according to our present knowledge. I perceive by the remarks of those who have discussed the paper that many do not understand the plan or precedures which I have outlined, and that they have not had personal experience in such practice. I nevertheless value the discussion which we have had, as in this manner I have obtained the viewpoints of many men whose opinions I value.

A discussion of the influence of sulfocyanates in the saliva and use of acid foods was purposely omitted from the paper in order that only measures of known value and efficacy in prevention of dental disease might be presented. Much has been written and said concerning the value of administration of sulfocyanates, but at best we must admit that it is still an open question. As to the recommendation of acid diets, our personal experience has shown that it seems to be of value in certain cases, but many were found who could not tolerate the acid diet, and who showed many distressing symptoms as a result of the experiment. We have also found that practically the same reaction of the saliva, *i.e.* the secretion of alkaline elements, may be obtained by the chewing of hard substances such as paraffin and gum, as by the use of acid foods and fruits. So that at the present time we are not prepared to accept the acid diet and mouthwash as a general procedure, although it may be of value in specific instances.

We have been working for years in the laboratory looking for a solution of the problem of control of dental disease. We are still working upon the problem, and have lately seen new developments in our knowledge which have caused us to change our opinion concerning certain of the oral phenomena. But I have not presented these tonight, as I did not wish to further confuse the issue by the introduction of other unproved theories.

The paper which has been given is the result of observations which have been made by the author personally for the purpose of learning how much of practical value is to be found in the measures which have been employed in the practice of oral hygiene. Many have for years practiced such measures as a specialty, and they have claimed great results. The author has personally visited many such offices to see the technique of practice employed, and to judge the results obtained. He was impressed in each case by the beauty of the dental and peridental tissues which were to be seen in the mouths of patients under such treatment. Many cases were seen of women who had been taken through the period of pregnancy several times without having contracted a single case of caries. Such observations, together with a personal application of the principles of oral hygiene to a limited number, has convinced the author that there is much value in such practice when sanely and intelligently pursued.

Someone objected to this plan because it did not reach the masses or care for the patient with modest means. In reply, I would ask, How much are you doing for them now? And what is more, What are you doing for those who can afford to pay for good dentistry? You are but patching them up with the most expensive repair work they can afford, and then dismissing them to develop a new crop of dental defects which you may have the opportunity of patching at another time. Is that your highest ideal of dental service?

The reason that I am here tonight to tell you this story is that I am absolutely convinced of the value and efficacy of such measures, and I wish to encourage you to try them out in your own practice. My belief is confirmed by the opinions and results of many general practitioners who have carried their service along these lines for many years. I lately asked one such practitioner as to his ability to prevent dental disease in his young patients. His reply was, "All that I have as proof is to compare the mouths of children I have treated during the past ten years with those of their parents. Many of my children go away to boarding-schools and I see them but a few times each year, but when I do, their mouths are sweet and clean, and they have mighty few cases of caries." I could name a dozen men in our section who are practicing this form of preventive dentistry, and the mouths of their patients are not breaking down with dental disease except in a few instances.

I cannot answer all the points which have been brought up in the discussion. It was noticeable that some have not yet seen the difference between "cleaning teeth" and "prophylaxis." In some cases, it is a difference of about ten to fifteen dollars—but the fee question is always beside the mark. Until you have seen this difference for yourselves, you cannot realize the importance of such work. Take, if you will, an average mouth. When you pull back the lips and examine the enamel on the buccal surfaces of the molars and bicuspids you will usually find it rough. Such roughness may be the result of faulty development of the teeth or decalcification of the enamel surfaces by the acids of fermentation. When such surfaces are cleansed by the ordinary methods they still remain rough, and new deposits, both soft and hard, immediately begin to form thereon, which the patient is unable to remove by means of the brush. By prophylaxis is meant the smoothing of such surfaces so that the patient is able to remove each day the excrescences which have collected. It is quite like the difference which exists between the rough surface of undressed wood and that of polished wood. The latter is much more easily cleansed; so also a smooth and polished tooth surface is more easily cleansed by the personal efforts of the patient.

Dr. McCall objected to the use of the rubber cup on the engine for the purpose of smoothing the enamel. In reply I would say that when the particular form of cup is used which I specified in the paper, namely, the small cylindrical Young's cup, I have never seen any damage done to the gum tissues when used with proper care and caution. It is a great time and labor saver, and is in daily use in the offices of many practitioners of Dr. McCall's own particular specialty. The old-fashioned bell-shaped cup is truly a menace, but this particular form is readily adapted to the buccal and lingual surfaces of the teeth, and will flare out beneath the gum margins and cleanse them without damage to the soft tissues. One thing which has militated against prophylaxis among general practitioners has been the insistence upon the universal use of the hand porte-polisher. The rubber cup will find a much wider acceptance, and if carefully used will accomplish great good in the preparation of tooth surfaces. It must be remembered that the object to be obtained is a smooth and polished enamel surface with the minimum loss of enamel substance.

Allow me to thank those who have discussed my paper and those who have listened until this late hour. The message which I attempted to bring to you is that of my present view of the only practical measures by which we may prevent dental disease today. Some day we may have a pill or a vaccine or a diet which will accomplish this great good which we seek, but at the present time oral hygiene is the only solution we have. I am here tonight to tell you that I believe in the sane application of such principles in everyday general practice, and to ask you to work it out in your own practice. If you put the same energy into such practice as you do into the technique of crown, bridge, and inlay work, you will see a profound effect upon the mouths of your patients, and will realize more clearly the real value of such preventive dentistry.

Dr. ESHLEMAN. I should like, at this time, to say just a word regarding the excellent paper that Dr. Bunting has presented, and the delightful manner in which he has given it. I move that a vote of thanks be given Dr. Bunting, and I would include in this motion also the paper of Dr. Cummer this afternoon. (The motion was seconded and carried.)

Dr. J. W. BEACH, Buffalo, then made a short address regarding the Preparedness League of American Dentists, urging those who had not already joined this League to become identified with it at once.

Dr. L. MEISBURGER, Buffalo, said that he had just received a telephone message from Dr. Burkhart stating that Dr. R. H. Hofheinz of Rochester had died. The speaker then made a motion that a committee be appointed to send a message of sympathy to Mrs. Hofheinz. (Motion carried.)

The meeting adjourned at 10.55 P.M.

(To be continued.)

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

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PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, MARCH 1917.

EDITORIAL DEPARTMENT

Another Point of View.

EVERY editor, dental or otherwise, must have had the gray matter of his cerebral cortex jarred from time to time by the evidence of his inability to express his thought in terms at once so lucid and intelligible as to render them free from the possibility of misinterpretation by his circle of readers, or by at least some of them. Whether it is the fault of the editor's form of expression or the intellectual amaurosis of an occasional reader, or a complication of both factors, is a problem which must wait for future solution pending the settlement of questions of more immediate practical utility and importance. However, the question is of sufficient interest to warrant consideration, and as a practical test we hope sometime to present a carefully prepared, clearly written article in as good Anglo-Saxon phraseology as we can command, setting forth with logical and convincing force the conclusion that when two and two are added together their sum equals the quantity which we designate as four. We are quite well aware that such a conclusion may be successfully disputed on metaphysical grounds, but from a practical mathematical standpoint we believe that both the major premise and the conclusion may be successfully defended. The point which we desire to achieve in the publication of the proposed argument is that when it shall have been done it will serve as a test at one and the same time of (*a*) the ability of the author to state his case, and (*b*) of the reader to comprehend the statement; in short, it will, like a chemical group reagent added to a solution of unknown composition, develop a reaction or else fail to develop a reaction. In the particular case under consideration, and judging from past experiences, we are inclined to prophesy that one of the reactions will be that someone will decide that the writer's contention is, in spite of his effort at lucidity, that two and two when added to each other produce five, or three, or some quantity other than four.

A writer in the *Bulletin* of the Association of Military Dental Surgeons of the United States* quotes extensively from the editorial in our September 1916 issue entitled "Dental Inefficiency," but from some cause not at all apparent to the writer the author in question apparently regards the use of the phrase "dental inefficiency" as a criticism of the inefficiency of the dental profession; whereas the editorial in September COSMOS was a discussion of the inefficiency of the dental apparatus of the average American citizen, and in particular of that group of American citizens whom the nation properly regards as its natural defenders in time of war as well as in peace. If we should at any time feel impelled to deal editorially with the inefficiency of the dental profession in any part or any particular we shall bear this experience in memory, and endeavor to free our mind in an editorial on the subject the title of which will be chosen with care in order that it may indicate with reasonable clearness the subject matter under discussion.

Again, "An Instance of the Survival of the Fittest"—the title of our January editorial—has by reason of its obscurity or the prevalence of the intellectual amaurosis before referred to, brought out some interesting reactions, the most peculiar of which is that "The Editor of the DENTAL COSMOS is advocating the use of cotton and creasote as a root-filling material"—this notwithstanding the fact that the editorial in question contains a specific disavowal of that purpose. Incidentally we publish elsewhere in this issue several interesting letters on the subject, and we also note with pleasure that our editorial colleague of *Dental Items of Interest* discusses the subject of cotton and creasote root-fillings at some length, although giving the impression that even he is not altogether devoid of a suspicion that the Editor of the COSMOS has a secret leaning toward the system of root-canal filling at one time so strongly advocated and largely used by the late Professor Flagg. Let us hasten to reassure our able and highly respected colleague, and all who may fear that we have in this instance strayed from the paths of microbiologic ethics, that their fears are unfounded in fact and therefore unwarranted.

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* Vol. I, No. 2, December 1916.

In the cases discussed involving the survival of teeth with cotton and creasote root-fillings, the significant point in our opinion, apart from the fact of their survival, is that such survival must be attributed to the action of the germicide, even though that action may be shown to be in a degree evanescent, rather than to the ability of the cotton as such to act as a barrier against reinfection. It is quite true that no radiographs were taken of the root-apical areas, nor were cultures made to test the sterility or otherwise of the old cotton fillings. Doubtless they would have been found to swarm with bacteria had the proper tests been instituted. Nevertheless, the teeth did survive, and it is barely possible that the creasote maintained sterility until the apical tissues were able to build a more or less effective barrier against reinfection, regardless of the imperfection of the cotton as a permanent physical barrier against reinfection. It is interesting in this connection to bear in mind the fact that cotton wool is the material universally in use as a stopper against the invasion of tubes of culture media in bacteriologic laboratories.

With reference to the sterilizing potentialities of creasote and the efficacy of the cotton root-filling, we would direct attention to the personal case reported by Dr. J. B. Williams in our present issue.

The principles underlying successful root-canal treatment which experience and scientific investigation thus far concur in accepting are two—viz, complete sterilization and the introduction of a barrier which will effectively prevent reinfection via the root-canal. In our April issue we shall have the pleasure of presenting a paper by Professor Hermann Prinz which will set forth a method of root-canal sterilization based upon scientific and clinical investigation that apparently brings the question of root-canal sterilization within the sphere of mathematical precision. The question of the physical obliteration of the root-canal and its ramifications with like certainty and precision is still in the experimental stage, with hopeful promise of satisfactory results in the near future.

A Correction.

DR. THOMAS P. HINMAN calls attention to an error in his article on Vincent's Angina, published in the issue of the DENTAL COSMOS for December 1916, where—on page 1355, 2d col., line 16—"mercuric chlorid" appears, instead of mercuri*al* chlorid, as the compound was designated in the author's copy. In referring to the drug mercurous chlorid, we would suggest the ordinary employment of its commoner designation, viz, "calomel."—ED. COSMOS.

Death of Dr. J. G. Lane.

WE much regret to announce the accidental death, on Sunday, February 4th, of Dr. J. G. LANE of Philadelphia. Dr. Lane was overcome by the fumes of gasoline in his garage. A full obituary notice will appear in the next issue of the DENTAL COSMOS.

BIBLIOGRAPHICAL

ORAL ABSCESSES. By KURT H. THOMA, D.M.D., Lecturer on Oral Histology and Pathology and Member Research Dep't Harv. Univ. Dental School; Instructor Dental Anatomy, Harv. Med. School; Oral Surg. Robert B. Brigham Hosp., Visiting Dental Surg. Long Island Hosp., Consulting Oral Surg. Boston Dispensary. Pp. xiv, 213. Boston: Ritter & Co., 1916.

Thoma addresses his book to the student and practitioner of dentistry and of general medicine. His purpose is to "give a clear understanding of the pathology, treatment, and prevention of oral lesions," and to facilitate "the recognition and nature of certain infectious diseases which may be caused by them."

The subject matter is arranged most logically. There is no ambiguity. The emphasis is for the most part well-proportioned; the laws of perspective are obeyed.

Thoma advocates radical procedures. He has scant sympathy with *ordinary* "conservative" dentistry. In this extreme he may err; but we must remember that as the evidence now stands it is better to err in this than in the opposite direction. Roentgenographic diagnosis, mild chemical agents in the root-canal (formalin is anathematized), ionic medication, resection of root-apex, extraction and curettage, conductive anesthesia: these procedures we soon learn are the *sine qua non* of the author's practice.

The chapters (IV and V) dealing with alveolar abscess due to other causes than diseases of the dental pulp, and abscesses of the tongue and salivary glands and ducts, as well as those sections in Chapter X outlining the treatment of the above conditions, are not up to the standard of the rest of Thoma's work.

The X-ray is constantly considered as infallible, which it decidedly is not. Dark areas around root-apices are not invariably indicative of infectious foci. In his discussion of ionic medication (page 161) it is not easily understandable why he should fail to recognize the fallacy of zinc and copper electrodes and the greater simplicity and efficacy of a sodium chlorid solution.

Perhaps it would not be amiss to mention a few undesirable faults of diction. The word "bacteria" is a plural, not a singular form; "interradicular" seems preferable to "interradial," and "apiectomy" is of illegitimate parentage. These, to be sure, are of minor importance, quite insignificant in the general trend of Thoma's argument, but still it would be unfortunate if such words were accepted by dental usage.

The illustrations, presented in the form of inserted plates, are extremely useful and beautifully executed.

Thoma is not only thoroughly conversant with the voluminous literature upon this subject in all its ramifications, but he is more than a compiler. The data of others he can judge and orientate by his own experience. An extensive and well-chosen bibliography forms a valuable asset to this already worth-while book.

Throughout this work, the doctrine of oral infection as an important focus for systemic disease is assumed as axiomatic. There was a marked need for an authentic, comprehensive statement of this modern pathologic concept, and Thoma has successfully met this need.

J. L. A.

Books Received.

Books received are acknowledged in this column, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

"Anatomy and Histology of the Mouth and Teeth." By I. NORMAN BROOMELL, D.D.S., Professor of Dental Anatomy and Clinical Dentistry, Philadelphia Dental College, and formerly Dean and Professor of Prosthetic Dentistry, Dental Anatomy, and Histology, Dental Department, Medico-Chirurgical College of Philadelphia; and PHILIPP FISCHELIS, M.D., Associate Professor of Histology and Demonstrator in Embryology, Medico-Chirurgical College of Philadelphia. Fifth Edition, revised, with 368 illustrations. Philadelphia: P. Blakiston's Son & Co. Price $3.00.

"A Text-book of Physiology." By WILLIAM D. ZOETHOUT, Ph.D., Professor of Physiology in the Chicago College of Dental Surgery and in the Chicago College of Medicine and Surgery, Chicago. Valparaiso, Ind.: Bogarte Book Company, 1916.

"Cleft Palate and Hare-lip." By Sir W. ARBUTHNOT LANE, Bart., M.S., F.R.C.S., Senior Surgeon to Guy's Hospital, and Emeritus Surgeon to the Hospital for Sick Children, Great Ormond St. Third Edition. London: Adlard & Son, Bartholomew Close, E.C., 1916. Chicago Medical Book Co., Congress and Honore sts., Chicago, Ill. Price $4.00.

"Fundamentals of Pathology. For Students and General Practitioners of Medicine and Dentistry, and for Nurses in Training Schools." By PAUL G. WOOLLEY, B.S., M.D., Professor of Pathology, University of Cincinnati; Director of the Pathologic Institute of the Cincinnati General Hospital. With 81 illustrations, including 1 color plate. St. Louis: C. V. Mosby Company, 1916.

"Human Physiology — Especially Adapted for Dental Students." By R. G. PEARCE, B.A., M.D., Assistant Professor of Physiology, University of Illinois, and J. J. R. MACLEOD, M.D., D.P.H., Professor of Physiology, Western Reserve University. Second Edition, revised, with 59 illustrations, including 10 color plates. St. Louis: C. V. Mosby Company, 1916.

"Dental Anatomy." By MARTIN DEWEY, D.D.S., M.D., Professor of Dental Anatomy and Orthodontia, Kansas City Dental College; President of the Dewey School of Orthodontia, Kansas City, Mo. Illustrated. St. Louis: C. V. Mosby Company, 1916.

REVIEW OF CURRENT DENTAL LITERATURE

[*Journal of the American Medical Association*, December 16, 1916.]

An Experimental Research into the Nature of Nitrous Oxid and of Ether Anesthesia, with Special Reference to Certain Effects on the Organs of the Body and Certain Relations to Normal Sleep, Hydrogen-ion Concentration and Infections. By GEORGE W. CRILE.

In this study Crile considers (*a*) the gross behavior of the anesthetized individual in a consideration of the relation of anesthesia to normal sleep; (*b*) the influence of ether and of nitrous oxid on the histologic structure of certain organs; (*c*) the relation of ether and of nitrous oxid to the H-ion concentration of the blood and to reserve alkalinity; (*d*) the relation of ether and of nitrous oxid to the infections, and finally (*e*) the clinical bearing of these studies.

During nitrous oxid anesthesia, as also in normal sleep, the lesions—from exertion, emotion, infection, acid injection, etc.—in the brain cells are repaired, and nitrous oxid exerts a measurably protective action on the suprarenals and liver as well. Ether causes marked histologic changes in the brain, suprarenals, and liver.

The H-ion concentration of the blood was increased by ether and by nitrous oxid; the acidity increased more rapidly under nitrous oxid than under ether, but the total acidity in either case was proportional to the depth of anesthesia.

During anesthesia the reserve alkalinity of the blood gradually decreased, the total decrease being greater under ether than under nitrous oxid. The alkalinity of the spinal fluid and of the bile was also altered during anesthesia.

The histologic lesions in the brain, suprarenals, and the liver, caused by ether and by nitrous oxid, though varying in degree, are identical in kind with those caused by the intravenous injection of acids, as with those resulting from insomnia, exertion, emotion, infection, or physical injury.

The administration of nitrous oxid and morphin will in part protect the organism against the damaging effect of infection.

The deduction from these studies is that anesthesia is an induced acidity. For the bad-risk patient—one whose normal reserve alkalinity has been drained—nitrous oxid anesthesia is to be preferred to ether. Analgesia with local anesthesia should be employed with general anesthesia only when it is demanded by certain phases of the operation. In Crile's own clinic, nitrous oxid anesthesia has been administered in over 15,000 cases without a death.

[*International Journal of Orthodontia*, December 1916.]

A Removable Retaining Appliance. By H. P. BEASER.

In probably the largest majority of cases the retaining appliance which is removable is indicated. The appliance described by Beaser is equally adaptable to a mesio-, neutro-, or disto-occlusion case. It is constructed of separate parts, one of which may be removed without disturbing the others. Each band is made and attached separately. It permits of being made into an active regulating appliance whenever the emergency arises. The materials used are the same as for any other appliance, plain bands for molars and canines. As made—*e.g.* for a case of bilateral disto-occlusion—a 16-gage vertical tube is soldered to the lingual side of the molar bands, and a slot cut on the mesial surface two-thirds of the length of the tubes from the occlusal end, large enough to permit a 20-gage wire to slip in easily. The wire is adjusted to the lingual surface of the teeth, and the ends are cut off even with the inner side of the slot. The wire is then taken out and a piece of 16-gage wire soldered perpendicular to each end, making a T-shape on each end of the 20-gage wire. It is then slipped into the tubes, and cut off smoothly. The T-shaped end of the 20-gage wire which fits the vertical tube prevents the molar from rotating. The tubes should be soldered to the molar bands at a slight angle to prevent the lingual wire from slipping out.

Small hooks are soldered to the lingual-cervical part of the canine bands to prevent the lingual wire from slipping up.

To antagonize the outward tendency of the upper anterior teeth a piece of 18-gage tubing is soldered to the labial surface of the upper canine bands, and slots cut therein to permit access of 20-gage wire. A piece of 20-gage wire is adjusted to the surfaces of the incisors, its ends hooked and slipped into the canine tubes. Appropriate spurs can be utilized to prevent rotation of the canine. Intermaxillary rubbers can be adjusted from the end of the labial wire to hooks on the lower molar band.

The simplicity of construction and wide range of applicability of this appliance commend it wherever removable retaining devices could be used.

[*La Stomatologia*, Milan, September 1916.]

The Spirochætæ of the Mouth. By G. Sangiorgi.

This study deals with the morphology of the spirochætæ of the human mouth. The method employed was that of Fontana-Tribondeau—*i.e.* impregnation with ammoniacal silver nitrate. There are four types distinguishable, two belonging in the strict sense to the genus spirochæta, two to the genus treponema. These four types are not always present in the same mouth.

Spirochæta, type A, diam. 0.8 mic.; length varies from 3.2 to 16 mic.; with from two to eight large, shallow, irregular turns.

Spirochæta, type B, diam. 0.4–0.5 mic.; length varies from 2.4–10 mic.; with from one to six small, shallow, irregular turns.

Treponema, type A, diam. 0.4–0.5 mic.; length varies from 2.4–5.10 mic.; with six to seven, at times ten, rigid, deep, regular turns.

Treponema, type B, diam. a fraction of a micron; length 4.8–8 mic.; with many—ten to fourteen—turns as in type A.

Spirochæta A and treponema A are the ones most frequently encountered. Sangiorgi identifies his spirochæta A with S. buccalis, his spirochæta B with S. media, and his treponema A with S. (T.) micro- and macrodentium. His treponema B he fails to identify with any previously described form.

[*Presse Médicale*, Paris, November 2, 1916.]

Treatment of Angina Due to Fusiform and Spirillar Organisms. By Favre and H. Doreyfouss.

Lesions with these organisms, though at times primary, as *e.g.* Vincent's angina and ulcero-membranous stomatitis, are usually secondary to dental caries, inflammation from an erupting third molar, mercurial elimination, and various bucco-pharyngeal ulcerations (*e.g.* syphilitic chancre)—*i.e.* secondary to conditions lowering the local resistance. Diagnosis of such lesions is easy with the microscope. They are objectively characterized by irregularity of outline, bright red margins, putrid basal layer, foul breath, intense pain, and trismus or dysphagia.

The authors advise a combined silver nitrate and methylene-blue treatment as equally efficacious, simpler, and less expensive than the more usual organic arsenical preparations.

Daily cleansing with small cotton swabs dipped in 10 per cent. $AgNO_3$ in distilled water is advocated. The bases of the ulcers must be made quite clean. A 1 per cent. methylene-blue solution is then freely applied. By the second or third treatment, improvement is already manifest. Healthy, firm granulations appear. Thereafter a 1 in 30 $AgNO_3$ solution is continued until complete recovery. If this does not occur by the eighth day, some other pathological factor coexists.

[*New York Medical Journal*, Oct. 21, 1916.]

Local Points of Infection: Suggestions for Locating Them. By N. P. Barnes.

A consideration of the tissue affinity and specificity of certain types of micro-organisms and their toxins indicated to Barnes a means of locating focal points by obtaining a reaction following a larger than a therapeutic dose of vaccine. The local result, indicative of the focus, is pain and swelling of the affected parts. Focal reactions are caused best, if not exclusively, by injection of the killed infecting micro-organism. Experience with autogenous vaccines for acne shows a high percentage of cases where the initial dose is followed by a marked exacerbation of the eruption.

Evidently from the context, Barnes believes his idea is distinctively new. In reality it seems to rest upon a principle long known in clinical experience and in diagnostic use, namely, hypersensitization. None of the examples he gives bear any direct relation to the oral cavity.

However, a number of cases briefly outlined by Wm. M. Wright (*Pennsylvania Medical Journal*, p. 112, November 1916, "Pathologic Conditions of the Mouth") bear interesting promise of the utility of Barnes' suggestion.

Case 1. Miss M., chronic anemia, pyorrhea, and three apical abscesses; streptococcus, no further differentiation. However, a stock streptococcus vaccine caused a marked exaggeration of subjective symptoms. Later, removal of teeth improved the blood.

Case 2. Woman—chronic arthritis deformans of fingers, apical abscesses. Streptococcus viridans. Vaccines caused a decided reaction in both fingers and alveolar process.

Case 3. Woman—headaches, neurasthenic syndrome, pyorrhea, apical abscesses. Streptococcus? Vaccines caused exaggeration of all symptoms, removal of teeth caused headaches to disappear; gain in weight and very slow general improvement.

Barnes' suggestion appears to have some applicability in discovering oral foci. It is well to remember that the vaccines are here given not for a therapeutic but solely for a diagnostic purpose.

[*New York Medical Journal*, December 30, 1916.]

Dental Infections in Systemic Disorders: Their Roentgenographic Diagnosis. By Sinclair Tousey.

It is impossible to over-emphasize the value and the necessity of radiography in dental practice. Tousey's paper is an illuminating presentation of the conditions where roentgenograms are indicated.

The chief value of this article lies in the frequent reference to concrete cases, reported in abstract, which have come under his personal and immediate observation. The dental diseases he considers are apical abscess, pyorrhea alveolaris, pulp stones, cysts, and impactions.

Their complications may be tuberculosis, neurasthenia, chorea, arthritis, neuritis, neuralgia, tic douloureux, sciatica, paroxysmal cough, cardiac lesions, exophthalmic goiter, eye diseases, tinnitus aurium, spinal cord lesions, gastric ulcer, cholecystitis, and gallstones. In all refractory cases of these conditions, whose etiology is obscure, roentgenograms of oral and sinus regions are indicated, because these serious disturbances of the equilibrium of health have been authentically referred to oral and sinus infections.

Besides the diagnostic employment of the X-ray, this agent has been employed therapeutically in pyorrhea alveolaris. Tousey refers to such cases, where he used X-ray and ultra-violet ray from high-frequency vacuum electrodes successfully where the customary dental treatment was absolutely unavailing. This reference is very unusual, and deserves corroborative studies. In conclusion, Tousey believes that the X-ray is to be depended upon to show whether or not the source of trouble is connected with the teeth or pneumatic sinuses, and if so, whether the trouble is due to malposition and unnatural pressure or to infection. It would be a mistake to regard every case as due to the teeth, and to proceed to sacrifice the latter without first making a radiogram which may acquit them of any complicity in the matter.

[*Dental Items of Interest*, November 1916.]

Some Studies of the Histopathology of Pyorrhea Alveolaris. By F. Hecker.

Hecker's problem is, "What do the cementum, the peridental membrane, and the alveolus look like when affected by pyorrhea alveolaris?" This question is answered by an exhibition of 23 photomicrographs.

From these we learn that the pathological change accompanying pyorrhea alveolaris affects these three tissues to a greater or lesser degree.

The cementum may show overdevelopment in a local area. The first change in the peridental membrane is that its fibers in a small area become swollen. This is followed by a disintegration of their substance, complete destruction of their continuity, and liquefaction. This local change, by continuity of tissue, is gradually extended to the whole membrane.

Centers of regeneration may be seen. This regenerated tissue may not unite with the root of the tooth, because the epithelium of the mucosa covers the free ends of the fibers of the periodontal membrane, and by this process the pocket is lined with epithelium of the same character as that covering other oral parts.

The affected area of the alveolus may undergo a granular, fibrinous, or fatty degeneration. Its bloodvessels show a marked perivascular infiltration of round cells. In the intercellular cement substance of the fat cells, round cells are noted. Regenerative processes have been seen in the alveolus.

[*Journal of the Allied Dental Societies*, December 1916.]

The Technique of Making a Gold Inlay.

By J. V. Conzett.

This technique is conveniently divided into 4 steps—(1) cavity preparation, (2) a proper wax and manipulation thereof, (3) a proper investment, burning out, and casting, and (4) a proper finishing and cementation.

In cavity preparation Conzett follows the principles enunciated by Black. This means "extension for prevention." As regards the depth of the cavity, the author insists that it be never less than 1.5 mm. The preservation of the pulp is of paramount importance. Its life should never be jeopardized if it is possible to avoid doing so. All carious dentin should be removed, but it is rather immaterial when this is done. Sometimes, where otherwise an undercut would result, the decay is allowed to remain until the model is made, Conzett believes in the beveling of the cavosurface angle all around the cavity, and gives excellent reasons against the butt-joint and the lap-joint. Before dismissing the patient with a temporary stopping, care should be taken to cleanse the cavity of saliva and organic débris; then a dressing of eugenol or oil of cloves should be inserted.

The wax employed should be hard at mouth temperature. Conzett uses constantly the Taggart wax, warming it by dry heat, over a flame. Wax of the proper consistence is introduced into the cavity in the form of a long cone. Because of its elasticity, in large or complicated restorations the forcing of the wax into such a cavity should be avoided. Conzett releases the elasticity of the wax, while the model is in the cavity, by a stream of warm water. The model must be carved to perfect contour and occlusion. This injunction is to be taken absolutely literally, as it insures the preservation of septal tissue.

After the carving is finished, the wax surface is smoothed with a little oil of cajuput on a pledget of cotton. Shrinkage of the gold is apt to make an inlay imperfect at the gingival margin. To obviate this Conzett removes a thin shaving of wax from the model where the inlay would come in contact with the occlusal step.

For investment, he takes plaster of Paris 1 part, finely pulverized silex 3 parts, and Dixon's flake graphite ½ part, thoroughly mixed together. Constant proportions of this material and of water are used. The temperature of the water is from 100° to 120° F.

Before the model is coated with the investing material it is washed off with a little soap on a camel-hair brush to remove any oily or muciferous material that would prevent the perfect adaptation of the plaster to the wax. As soon as the investment is hard, Conzett begins to burn it out, being careful not to overdo it. He uses a "one-heat electric heater," and subjects the investment to this for a constant period. He casts with the flask cold, employing the Taggart machine. The gold is melted with the oxyhydrogen blowpipe. The gold is brought to a white heat; it should not boil. A force of 5 pounds is sufficient to cast, maintained for at least 30 seconds. Where the inlay is subject to masticatory stress, 23-k. gold is used, elsewhere pure gold. After cooling, wash and pickle the inlay in hydrofluoric acid for a few moments.

Bubbles are sought for with a glass and removed. The inlay is tried in place and thoroughly seated by malleting; if necessary, correct the occlusion at this stage. The margins are burnished and disked and all the finishing but the final polish is done before cementation. If the inlay is hard to remove the point of a Black back-action plugger No. 7 is placed in the interproximal space just above the contact point. A tap with a mallet once or twice will dislodge the inlay. In occlusal cavities it is not advisable to mallet to place unless a portion of the sprue is left on the inlay. Before cementing, the cavity is cleansed, dried, and sterilized with alcohol.

The cement is mixed to creamy consistence. Margins must be burnished before crystallization begins. Final polishing may be done at the same sitting or at the next one.

The reading of Conzett's paper impresses one with the real value and necessity of constant methods to secure constantly satisfactory results. Constant materials, constant temperatures, and constant time periods are time after time insisted upon throughout the essay.

[*Oesterreich.-ungarische Vierteljahrsschrift fuer Zahnheilkunde,* July-Oct. 1916.]

A Case of Resection of a Root Apex Extending into the Maxillary Sinus, and Other Dento-nasal Cases. By M. Guhrauer.

Guhrauer gives here a report on three very interesting cases, his procedures being in some respects unusual. The first case gives origin to the first part of his title. A woman, age twenty-one years, had had a small filling inserted in an upper right first molar. The pulp had died, accompanied and followed by much pain and swelling which gradually disappeared. Later, severe cephalgia on the right side began, which did not yield to antineuralgics. The right nasal cavity was full of pus, arising from the middle meatus; an X-ray and puncture showed empyema of the maxillary sinus. The upper right first molar was absolutely insensitive, and reacted only extremely weakly to the electric test for vitality. The apex of the palatine root extended free into the antrum. Guhrauer decided against extraction of the tooth. The three root-canals were most carefully filled with gutta-percha points. The maxillary sinus was opened from the canine fossa, its mucosa curetted, and the apex of the palatine root cut off. Complete and uneventful return to normal followed, and the patient was left with a fully functioning tooth.

The second case is that of a man, age forty-two years. Examination revealed a swelling on the floor of the left nasal cavity almost occluding this passage. The oral mucosa was inflamed and spongy, retaining traces of a lead stomatitis of ten years previous; the alveolus was atrophic; a part of the root of the upper left second incisor remained. From this region had arisen the radicular cyst displacing the floor of the nose. The cyst is noteworthy because its epithelial lining was referable rather to the oral mucosa than to the periodontal débris of Malassez. The cyst was opened by reflecting an oblong stalked flap extending to the frenum of the upper lip. Through this opening the cyst epithelium was entirely curetted away. The oblong flap was introduced into the cavity, to "re-epithelialize" its surface, and the cavity was entirely closed off from the mouth. Packing and drainage was performed through the nostril. The root remnant was extracted and recovery was rapid.

The third case is that of a boy of fifteen years. The floor of the right nasal chamber was covered with pus. There was a fistulous opening immediately above the upper right first incisor, which, however, appeared perfectly healthy. Transillumination showed that both the upper right first and second incisors contained dead pulps. An X-ray showed continuity between the second incisor and the fistulous opening. It is very interesting to note that the root-canal of this tooth was well filled, and that from its foramen a gutta-percha point projected far into the jaw tissue. The apices of these two teeth—first and second incisors—were resected. Recovery in all respects was rapid.

[*Dental Review,* December 1916.]

Etiology and Treatment of Pyorrhea Alveolaris. By V. B. Newell.

The dentist all too frequently ignores the urgent desirability of keeping an exact and thorough case-record. While Newell's entire paper is carefully composed, the part outlining the examination preliminary to treatment for pyorrhea deserves special notice. It is in accord with the broadest principles of dental science and art.

Inspection: Record of name, age, sex, habit, and all general conditions which may have a bearing upon the case, and a description of conditions found in the mouth; note all loose teeth, marking for extraction all hopelessly loose teeth and roots; note all misfit crowns and bridges, all carious abscessed teeth, and by all means all absent or destroyed contact points and malocclusions.

X-Ray: Obtain roentgenograms of all very loose teeth, pulpless teeth, and abscessed teeth; the roentgenograms should include not only the entire root of the tooth involved but sufficient of the area beyond and around the apex to determine any pathologic condition that may exist.

Microscopic: Smears of contents of pockets examined for live organisms and also stain-preparations.

Urinalysis: For sugar and albumin.

Heart: Stethoscopic.

Intelligent regard for the data from this examination would make pyorrhetic treatments less empirical and haphazard. A definite course of treatment could be outlined from the very beginning, appropriate to all the idiosyncrasies and exigencies of the individual case.

[*Journal of the American Medical Association*, January 13, 1917.]

Bad Teeth and Their Effect on the Laboring Man's Efficiency. By Carl E. Smith.

The oral lesions are here considered from the economic standpoint. In 16 months, Smith made 30,000 mouth examinations, 17,000 of American born, and 13,000 of foreign born.

Of this number, 96 per cent. are in need of dental service; only 4 per cent. have clean, healthy mouths; 9 per cent. are without cavities, and could be made healthy by thorough cleaning, the rest have all the pathological conditions known to dentistry—such as pyorrhea pockets, decayed and abscessed teeth, and mucous plaques with all the virulent bacteria ready to cause disease the moment there is a lowering of the resistance.

Quite apart from systemic complications, the teaching of oral hygiene to the laboring man is important, if it does nothing more than prevent caries, pyorrhea, and other mouth diseases.

In 30,000 mouths, Smith found about 60,000 cavities. Later in this report it will appear what a cavity means to the average laboring man.

In 30,000 mouths, about 18,000 extractions are necessary, and experience shows these teeth to be practically all abscessed. From these 30,000 mouths there have been 40,000 teeth already extracted, which tells the story of improper mastication, if nothing else.

One way to estimate the loss of efficiency due directly to toothache is by watching the pieceworker. Very often a man engaged in piecework will say, "Doctor, this tooth has ached for a week." The loss of money to these men runs from $3 to $7 for the week; those suffering for a day report losses of from 35 cents to $1.50.

In 30,000 mouths Smith finds 60,000 cavities and 18,000 extractions necessary. If each one causes an average loss, through waste of time and cost of repair, of $2, it means a cost of $156,000. In New York City last year 67,000 children failed to be promoted to higher grades because of absence, 80 per cent. of which can be laid to defective teeth, and it costs New York $1,037,696 to duplicate a year's schooling to these absentees. These same children in a few years will be employed by our industrial concerns, and a large percentage will fail of promotion on account of poor health due to bad mouth conditions.

Prevention is the answer to this economic loss, and Smith would have prevention begin before birth. Not only should the prospective mother's oral condition be cared for, but she should be instructed in the proper diet for the upbuilding of substantial calcareous tissues. Her dentist should instruct her regarding the mouth of her child when it arrives, and also regarding the care of that mouth after the teeth begin to erupt. The dental clinics of the public school, first seeing the child at six years of age, have too great a handicap to overcome successfully.

The signs of the times, a realization of the economic importance of a healthy mouth, can be read in the fact that during the past two years dental clinics have been established in a number of large industrial concerns.

[*Journal of the American Medical Association*, January 20, 1917.]

A New Operative Procedure Facilitating the Adaptation of Artificial Dentures. By H. A. Potts.

The retention of artificial dentures in an abnormal mouth as well as in a normal mouth depends upon adaptation, adhesion, and atmospheric pressure. To correct the abnormal mouth, surgical procedures are resorted to, namely, the removal of loose fibrous or spongy tissue, the cutting of fibrous bands, the excision of spicules of process, or well-defined osteoid growths which occur in the palatal, labial, lingual, or buccal regions of the jaws; also modification of the frenum of the upper lip and insertion of the buccinator muscle.

Potts believes that the removal of exposed projecting process after extraction should be more frequently done than is the present custom. In fact, this whole idea is rather novel to prosthetic thought. By this surgical interference the practical elimination of bony undercuts in the maxillæ can be assured. This would facilitate the making of swaged metal plates, and eliminate the necessity of making cores. However, the simplification of the dentist's labor is of less value than the more efficient restoration of function of the patient.

Potts gives as an illustration one case history in detail, with three figures.

[*Journal of the American Medical Association*, January 20, 1917.]

Blastomycosis of the Tongue. By Gordon B. New.

New, in a review of the literature, was able to find only one case of blastomycosis of the tongue. The case here reported makes the second one on record. The patient was a man of fifty-two years, heredity good, and probably nothing pertinent in his own personal history. The swelling on the tongue had been noticed eleven months before presenting to New. There was a shortness of breath; great difficulty in swallowing solids; no swellings noted in the neck; weight much below normal; speech difficult, nasal. A nodular tumor was seen at the base of the tongue, filling the entire pharynx, firm but without the hardness of malignancy. It appeared in rounded folds, between which were grayish-white areas. There were no other oral lesions. Microscopy of the tumor tissue revealed a lymphoid hyperplasia with great numbers of plasma cells. Blastomycetes were cultivated from folds of the tumor. Injection into guinea-pig, negative. Potassium iodid was given. Iodin was used locally. Radium also was applied—26 hrs. of 22 mg. tube during a period of three weeks. In 5 weeks there was marked improvement. Radium, 16 hrs. of a 50 mg. tube, was then given during 2 weeks; local application of iodin continued. In 4 weeks patient was perfectly well, with tongue normal.

It must be remembered that blastomycetes may be found in the tonsils and lingual tonsil, so that the presence of blastomycetes alone does not necessarily mean that the disease is true blastomycosis. It would seem the lymphoid hyperplasia was a secondary condition stimulated to growth by the presence of blastomycetes, possibly in the lingual tonsil.

PERISCOPE

To Remove Rubber from Diatoric Teeth.—Diatoric teeth are often broken in removing the rubber from the holes. It may be easily and safely done by putting the teeth in a small bottle and covering them with strong nitric acid, and letting stand for a day or more. *Warning:* This method should not be used with teeth having base-metal pins.—D. W. Barker, *Dental Digest.*

To Apply Iodin.—Iodin will penetrate the deepest pocket or crevice if the tissues are thoroughly dried. Napkin the mouth, evaporate the moisture by use of warm air—chip-blower or compressed—and apply tincture of iodin. Wait thirty seconds before removing the napkins, which should be moistened first. Treat in like manner every other day, and in a few weeks the pyorrhetic conditions should be better.—Homer Almon, *Dental Review.*

A Cast Cope Crown.—In making a cast cope crown with either a porcelain crown or facing, the best results are obtained if the post is "cast integral"—as the auto salesmen say—with the cope itself. Make the orifice inside the root a trifle larger than usual, slightly grease the inside with white vaselin, form the casting wax to a small, pointed post shape in the fingers, insert in the enlarged and lubricated canal, press firmly to position in the canal and over the end of the root; quickly press the previously carefully ground crown or facing to position, and you have an adaptation that will require the very minimum of manipulation and correcting in order to become perfect. Before investing, scrape a very thin shaving from entirely around the post in order to allow the cement to have sufficient room to escape when the finished crown is set.—Arthur G. Smith, *Dental Review.*

Advantage of Hollow Inlays.—There are four very good reasons why the internal part of the wax pattern for a cast gold inlay should be cupped out: (1) In vital teeth, to allow for a considerable thickness of cement as an insulation between the inlay and that part of the cavity directly over the pulp; (2) by diminishing the bulk of the metal, shrinkage is reduced; (3) by forming a retention box in the inlay, added retention is assured; (4) material is saved which otherwise would be needlessly wasted.—*British Journal of Dental Science.*

Pulp Devitalization.—So thoroughly am I convinced of the inadequacy of pulp devitalization and of root-filling as a proper therapeutic measure, that I am going to violate traditions and make a prophecy for you. I believe this meeting will mark a new era in dentistry, and that in later years the profession will point to this paper by Dr. Ulrich as the beginning of rational thought and practice in this field. I further predict for you that in twenty-five years the man who wantonly destroys pulps of teeth will be held to as strict an accountability by the law as is the medical practitioner at the present time who fails to observe common, ordinary prudence in the treatment of a case.—F. B. Kremer, *Xi Psi Phi Quarterly.*

Wilson Method for Taking Upper Impressions.—Dr. Wilson of Cleveland describes his method of using a properly shaped and trimmed britannia metal tray with beeswax attached to the posterior border as follows: While the beeswax is still soft an impression is taken at the juncture of the hard and soft palates. This tray, with the beeswax as an integral part, is removed and chilled. The surface of the beeswax is softened over a small flame, the tray returned to the mouth, and firm pressure brought to bear upon the tray, just beneath the beeswax. If provision is to be made for the denture to restore the canine eminence, beeswax is added in the proper place at this time and the tray returned to the mouth. These additions are then conformed to meet the requirements. Plaster is mixed very thin and placed in this improvised tray, the posterior beeswax border being placed in position first, thus preventing the plaster from running down the throat, and firm pressure maintained while the anterior portion of the tray is brought into position with the fingers of the right hand, at the same time using the thumb and forefinger of the left hand to push the corners of the mouth toward the center of the tray.—D. D. Campbell, *Western Dental Journal.*

Radiography in Dentistry.—While the radiogram is relative, not absolute, we are dependent on it for our estimate of tissue loss both in chronic suppurative pericementitis and chronic abscess. The interpretation of the films is a fine art, but no amount of experience will save one from occasional surprises and disappointments. A large granuloma, for example, may involve only the spongiosum, and where the external and internal bony plates are thick and dense, the picture will not define the area. To differentiate between an active infection and a rarefied area which has been disinfected and is undergoing repair is difficult or even impossible, especially in a dense field. The relation of tooth roots to rarefied areas may quite obscure a lesion where the exposure has been made from only one angle. Even though unsatisfactory at times, radiography is an indispensable factor in the diagnosis of bone lesions associated with the teeth, and the percentage of failures or mistakes in diagnosis is relatively small.—F. B. Moorehead, *Dental Summary.*

A Simple Casting Method for a Precise Restoration of a Root-end to Receive a Porcelain Jacket Crown.—The periphery of the root-end is dressed down until it presents a level seat just below the free margin of the gum. A strong dowel with the crown portion notched is selected and fitted *snugly* into the root-canal, as this method does not require that the pin withdraw freely with inlay wax. A small impression cup or copper band made to fit the root-end is filled with Kerr's impression compound; with the pin in place an impression is taken of the root-end, using plenty of force and chilling the compound thoroughly. The hardened compound will bring the pin away with the impression. Now mix an inlay investment rather thicker than for an inlay, carefully paint the inside of the impression, and then pour it. When thoroughly set soften the compound in warm water and remove carefully. We now have a model in inlay investment of the root-end with the pin in correct position. Now melt inlay wax and build it around the crown portion of the pin as desired, into the typical form required for reception of a porcelain jacket crown. Heat a sprue and attach it to the wax carving. Dip the sprue, carving, and model in water; make a mix of inlay investment and paint both carving and model; invest, burn out, and cast as usual. The result will be a root-end reproduction which will fit with perfect accuracy and with a pin that will be tight in the root-canal.—I. A. Smothers, Evanston, Ill.

Some Advantages of Removable Bridges.—Removable bridges will be found of great advantage, especially in saddle work. Some of the advantages obtained by removable bridges are: Proper care from a hygienic standpoint, opportunity for prophylaxis from the dentist's standpoint in taking care of the adjoining teeth, repairing the bridge in case of accident, adding to the bridge in case of necessity, being able to grind and adjust the bridge to accommodate the settling of the bite, and polishing the bridge to its original finish; whereas in the case of a fixed bridge, use of the lathe after setting would be an impossibility. The settling of the bite has proved to be an important factor in the life of bridge work. In bridges which have been worn for a time, although originally adjusted perfectly as to the contact between the gums and facings, a few years later the facings will be deeply embedded in the gum tissue. You can readily understand how, with a removable piece, the trimming or adjustment necessary is easily possible. The condition referred to can often be seen in cases where the buccinator muscles are attached high up on the alveolar ridges.—A. W. Jarman, *Dominion Dental Journal.*

A Porcelain-Faced Inlay or Inlay Crown.—In the case of a first or second bicuspid which has been filled mesio-distally, and in which the buccal wall breaks off, leaving a good lingual wall, if it is not desirable to put on a gold crown or to cut away the good tooth structure that is left, the lingual wall can be prepared as for an inlay, cutting off the occlusal surface so that gold will protect the tooth surface that is left. Grind the buccal wall down beneath the gum margin the same as for a Richmond crown; take an impression of the tooth with Detroit carving compound, embed it in plaster, place over it the ring of the Ajax swager, pour a die of Melotte's metal and swage a matrix of 28- or 30-gage, 24-karat gold. Put into place and burnish well to all margins, fit pin, remove with sticky-wax, and solder the pin to the matrix. Grind the facing in the usual way and back with 24-karat, 30-gage gold. Now put the matrix in place on the tooth, fill with wax, push the facing into place, and have the patient close the mouth. Carve the cusps and mesio-distal walls to suit, cast and finish in the usual way. Cement into place and after twenty-four hours grind the gold to lingual margin wall. In this manner a beautiful and practical porcelain-faced inlay or inlay crown can be made.—J. Findley Smartt, Waco, Texas.

Use of the Matrix in Amalgam Operations.—The matrix should invariably be used in all but four-walled cavities, preferably cut from thin copper, and tied in place with the ligature. Flat floss is suggested as better than the ordinary floss, but the matrix should not be tied so tightly that the amalgam cannot be forced beyond the margins. Unless it goes beyond, it is not certain that the margin is covered.

Crandall's technique for making the matrix is the best I have found or used. Punching the hole for the contact point and splitting the matrix from the occlusal or gingival margin to the hole as required are decided advantages, permitting easy adjustment, especially on teeth of the bell-shaped variety. The split also makes possible the tearing of the matrix and its easy removal in two pieces.

Copper bands for seamless crowns make excellent matrices for badly broken-down molars, with holes mesially and distally for contacts and splits in the band as conditions may require.

A very important step in the use of a matrix is its removal. Unless it can be easily removed, it had better be left for twenty-four hours, until the amalgam is hard and there is no danger of disturbing the filling. Many fillings have been ruined by the removal of the matrix, which in many cases is very difficult where the split matrix is not used, especially when there has been mechanical separation.—R. B. Giffin, *Bulletin Calif. State Dental Association.*

Educating the Patient with Regard to the Necessity of Bridge Work.—The fact that patients ask for the restoration of anterior teeth only, is by no means an excuse for a dentist to place crowns or bridges in the front of the mouth before any missing molars and bicuspids have been restored. Much crown and bridge work is attempted without such consideration. The term "restoration" with crown and bridge work should mean restoration with the object of perfecting the entire occlusion. Time must be taken to thoroughly convince the patient as to the reason why crown and bridge work should be done for them. The importance of good mastication to the individual cannot be too strongly emphasized. In many cases it will be important to explain why the loosening of teeth—the condition known as pyorrhea—often has its origin from failure to restore molar and bicuspid masticating surfaces at the proper time. The downfall of the individual teeth affected originated from an unequal distribution of forces during the process of mastication. It is important to emphasize enough of the general principles of crown and bridge work to enable our patients to see the reason for restoring the masticating surfaces and for the protection of the incisors. Facial restoration is also accomplished by opening the bite, which in many cases will be found closed through the loss of teeth or from the wearing down of the tooth surfaces, as the result of partial loss of occlusion of the molars and bicuspids.—A. W. JARMAN, *Dominion Dental Journal.*

Removal of Living Pulps.—In root-canal work we cannot hope to make our dental asepsis equal to true surgical asepsis, but if we recognize the weak spots in our attempts at asepsis, we may fully protect the patient with germicidal or antiseptic agents. For example, we cannot sterilize the entire mouth, but we can with fair certainty sterilize the immediate field of operation; we may then isolate this field with the rubber dam, and we can then again sterilize the included teeth and the dam itself.

Before removing a pulp, therefore—and the routine is the same in all canal treatment—the gums and four or five teeth should be thoroughly cleansed, using a disclosing solution to be sure that all plaques have been removed, after tapes with pumice, or what I prefer, a fine silex, have been passed between the teeth. The parts are then to be thoroughly sprayed to make sure that no débris remains. Next use a cotton swab dipped in alcohol, and rub the gum well to remove all inspissated mucus. Finally coat the gums and teeth with tincture of iodin, forcing the iodin under the gingival crevices with a sharpened orange-wood stick. After placing the dam so as to isolate four teeth at least, the surfaces of all these teeth and of the dam itself should be swabbed with alcohol. This alcohol swab may be repeated throughout the operation, especially when blood or seepage of any kind escapes from the canal and flows upon the dam or adjacent teeth.—R. OTTOLENGUI, *Dominion Dental Journal.*

Granuloma.—It is very questionable in my mind whether granuloma should longer be considered an abscess at all. Usually in these cases the radiograph shows a well-defined area of bone rarefaction, and if the tooth be extracted, we find at the apex a mass of soft tissue which years ago was called an abscess sac, but which now is spoken of as a granuloma. If the word sac conveys the idea of a tissue bag filled with pus, it is a misnomer. Except in the case of true cysts, these tumors are very solid. Whether they begin as a result of infection, or become infected subsequently, is another question open to discussion. That organisms can be isolated from these granulomas after extraction of the teeth seems to be the common experience; yet sections of granulomas, when stained for bacteria, have thus far defied our experimental research. That the organisms should abide solely at the periphery, thus making it possible to incubate them by merely dipping the extracted root-end into bouillon, seems extraordinary.

However, it is exactly these granulomatous cases that are said to be the most prolific causes of distant symptoms. Hence they must be cured, eradicated, or the teeth extracted. Fortunately, ionization frequently in these cases seems efficacious;—at least, we have evidence of such conditions clearing up and giving place to growth of new bone, after ionization. Some say that these cases have been cured by ionization; others say that they have cleared up as a result of the canal treatment.—R. OTTOLENGUI, *Dominion Dental Journal.*

Wiring the Teeth Together in Treatment of Fractures.—Objection may be offered to the idea of lacing the teeth together so that the jaws cannot open, unless there are teeth missing, the loss of which affords opportunity for feeding; but there is very little ground for objection, since at least a semisolid diet is indicated, and this may easily pass behind the third molars in the great majority of mouths. The Angle clamp band requires that the teeth shall be separated by wedging before the cementation can be properly effected. Dr. S. G. Ritchie of Halifax has suggested a slight modification, in that he uses matrix metal—thin sheet steel—which may readily be forced between teeth where it would be absolutely impossible to force a clamp band. A piece is fashioned long enough to make a loop around the tooth, with the ends extending labially far enough to allow holes being punched in them for the insertion of a threaded bolt. The bolt is passed through the holes, washers to prevent the tearing of the steel are placed over the bolt ends, and the nuts are screwed tightly. These are now loosened, the band removed, and cement placed inside, just as in the case of the Angle clamp band. These particular clamp bands may be readily made when the Angle clamp bands are not to be had, and there is always this advantage, that there is no guesswork about their fitting. Should either type of band irritate the cheek, it is a simple proceeding to cover the projecting bolt or tubes with a piece of softened gutta-percha.

Neither of these clamp-band attachments has any advantage over the direct wiring to the naked tooth, and they are both more difficult to apply, since the lacing wires may be attached under any condition of moisture, while a considerable degree of dryness must be secured to render the cementing medium of any value. Moreover, some time is necessarily consumed in their preparation, while the simple wire loops may be adjusted immediately.—J. M. Magee, *Dominion Dental Journal.*

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HINTS, QUERIES, AND COMMENTS

Cotton and Creasote as a Root-canal Filling.

To the Editor of the Dental Cosmos:

Sir,—I have read in your recent editorial the reference to the old practice of filling the roots of devitalized teeth with cotton dipped in wood creasote, which after the lapse of thirty-five to forty years was found preserving the teeth to their owners, and as antiseptic and healthy as when put in—no trouble all those years—which seems remarkable, but was no doubt good practice in those days.

Now let me relate some little experience of my own in a practice of fifty-six years. For at least thirty years, perhaps more, it has been my habit to pack a small pledget of sterilized cotton dipped in oil of cassia of Ceylon—imported, full strength (not American substitutes)—laying it on a napkin to absorb the surplus, and getting it down to the apex if possible, and then filling with any good cement or gutta-percha. I cannot now remember a single case returning to me on account of trouble or for re-treatment. No leptothrix, no pneumococci, no streptococci, or other "alligators or boa-constrictors," can exist for a moment when they get a whiff of this pungent oil; they either "cash in" at once or move their camp farther west, and my faith stands for this treatment still, all the root-canal treatments now on the market notwithstanding, and they are legion. I have never mentioned this treatment before in print, but give it now to my brother practitioners.

Charles A. P. Gurnsey, D.D.S.

Evanston, Ill.

To the Editor of the Dental Cosmos:

Sir,—The editorial, "An Instance of the Survival of the Fittest," in the January Dental Cosmos, fails to state that the cotton used by Dr. Flagg was ordinary cotton-batting, not absorbent cotton such as we use in our practice. I remember reading an article by Dr. Flagg in which he strongly recommended cotton-batting, and drew attention to the fact that it was just about moisture-proof. He illustrated it by stating that bales of cotton had been taken out of the ocean and found perfectly dry just beneath the surface. I am fearing lest some practitioner who might not be having very good success with his root-canal fillings might decide to try with absorbent cotton the method recommended by Dr. Flagg, and lay up sorrow for his and his patients' old age.

Sincerely yours,

Frederick H. Bowman.

Springfield, Ill.

To the Editor of the Dental Cosmos:

Sir,—I have just read the editorial in the January 1917 issue of the Dental Cosmos. Perhaps a history of my upper right central would interest your readers.

An approximal cavity was filled with gold in that tooth when I was fourteen years of age. It gave trouble later, and the dentist said the "nerve" must be removed. An opening was made from the palatal surface, and the root filled. Soon after, an abscess formed and discharged through the gum over the root.

About five years after that I attended a meeting of the Wisconsin Dental Society. This tooth was then opened by the late Dr. C. C. Chittenden of Madison, Wis., and a rope of cotton about two inches long was removed.

At that time I lived in a small town where there was no other dentist, so I treated the abscess myself by pumping tincture of iodin into the tooth until it appeared through the opening in the gum. The abscess healed and the root was again filled.

The crown of this tooth was filled three times; then an inlay was put in. Soon after the inlay was inserted the crown broke off, and a porcelain crown was put on. An X-ray picture was made and three experts said the condition at the apex of the root was ideal. Some time ago the root split, and one week ago it was extracted. The apical end of that root is filled with *cotton and creasote.* I put it there myself more than forty years ago. That part of the tooth never gave any trouble during that time.

Yours truly,

J. B. Williams, D.D.S.

Ashland, Wis.

OBITUARY

Mr. Arthur Swayne Underwood.

[See Frontispiece.]

Died, Saturday, December 2, 1916, in London, England, in his sixty-third year, Arthur Swayne Underwood, M.R.C.S., L.D.S.E.

Mr. Underwood was born January 18, 1854, and received his education at King's College School, King's College, and King's College Hospital. He entered the Dental Hospital (now the Royal) which had been opened to patients in 1858, and in due course became a house surgeon, later assistant dental surgeon 1881–86, finally full surgeon, 1886–87. From 1884 until 1896 he was lecturer on dental anatomy.

While at King's Mr. Underwood was appointed Warneford scholar (1872), and he took his M.R.C.S.Eng. in 1877, and one year later his dental diploma of L.D.S. In 1884 he was elected professor of dental anatomy and physiology at King's College, a post he retained until 1906. He was also dental surgeon to King's College Hospital, relinquishing a like position in the West London Hospital (1882–84).

The blue ribbon of his profession—the presidency of the Odontological Society—came to him in 1903, and not a few will recall how admirably he filled this difficult post. He was a member of the court of examiners in dental surgery of the Royal College of Surgeons of England from 1900 to 1910; a member of the Faculty of Medicine, and sat on the board of studies in dentistry of the University of London when that university decided to grant its degree in Dental Surgery.

In 1911 he was inspector of dental examinations in the United Kingdom on behalf of the General Medical Council. At the International Medical Congress held in London in 1913, Mr. Underwood was elected a vice-president of the stomatological section, and in the following year he became president of the anatomical section of the International Dental Congress. From 1913 he had been an examiner in dental surgery in the University of Bristol, and this post, as well as that of dental surgeon to King George Hospital, undertaken as soon as it was opened, he retained until the time of his death. He received (1906 to 1908) the Royal College of Surgeons' award of the Tomes prize for research.

He was one of the promoters of the British Dental Association and an original member. Later he became editor of the association *Journal,* and for years was chairman of the Publication Committee.

Mr. Underwood was also for some years editor of the *British Journal of Dental Science,* and many of his researches were published in its pages.

In 1881, at the International Medical Congress (London), Mr. Underwood, collaborating with his medical friend, the late Mr. W. J. Milles, published his research on "The Nature of Dental Caries." This fine piece of work was the first microscopic demonstration of the bacterial causation of dental caries. Koch, on seeing Mr. Underwood's preparations, admitted being convinced of the accuracy of his work and deductions.

In 1883, two years later, Miller published his work on "Dental Caries," and admitted that he owed to Mr. Underwood his inspiration. The value of this research of Mr. Underwood is undoubted when judged not only by the standard of results but by that of the methods adopted. In 1906 Mr. Underwood contributed an important paper on the "Anatomy of the Maxillary Sinus." This was read before the British Medical Association, and was supplemented about a year later by another paper which was received by the Anatomical Society. These papers were published in the *British Journal of Dental Science,* and are now recognized as having advanced our knowledge upon a subject important alike to the surgeon and to the stomatologist. In 1913, working in conjunction with Prof. Lovall Evans, D.Sc., and Mr. A. W. Wellings, Mr. Underwood presented to the International Medical Congress a communication on the "Nature of Enamel." In it was demonstrated beyond cavil the existence in human enamel of a certain amount of organic material. This striking piece of work was the first proof of the true nature of enamel, a material which had been assumed by most observers to be of a wholly inorganic composition.

The world is the poorer when such a one dies, but the world is much richer that such a one has lived.

[The foregoing account of Mr. Underwood's career is an abstract of an editorial notice in the *British Journal of Dental Science.*—ED.]

Dr. William Henry Keller.

DIED, at Havana, Cuba, December 1, 1916, in his seventy-first year, from Bright's disease, DR. WILLIAM HENRY KELLER.

Dr. Keller was born in Lynchburg, Va., September 17, 1846. He received his literary education at the Virginia Military College, and at Heidelberg, Germany. His professional education was obtained at the Dental University of Lima, Peru, from which institution he was graduated in the year 1871, and at the University of Havana, Cuba, from which he was graduated in 1879.

Dr. Keller entered upon the practice of dentistry in Rio Janeiro, Brazil, in 1868, where he practiced for several years, afterward removing to Mexico City, Mexico, where he carried on his profession for thirty-six years.

Dr. Keller was particularly interested in prosthetic dentistry and in crown and bridge work, in which specialties he was highly proficient, being the inventor of several improved methods of practice in these specialties. He was a member of the Mexico City Dental Society, serving as its vice-president, and later was made an honorary life member.

Dr. Keller was very prominent in Masonic circles, having received the thirty-third degree in Masonry. He was a personal friend of ex-President Diaz of Mexico, and was president of the American colony in the City of Mexico for many years.

He was married to Miss Miriam Selby, daughter of the late Colonel J. W. Selby, Manager of the Atlanta branch of the S. S. White Dental Mfg. Co., in Baltimore, Md., in 1878. His wife, with one daughter, survives him.

Dr. Keller was buried in Havana, Cuba, December 2, 1916.

Dr. Henry Bliss Hayden.

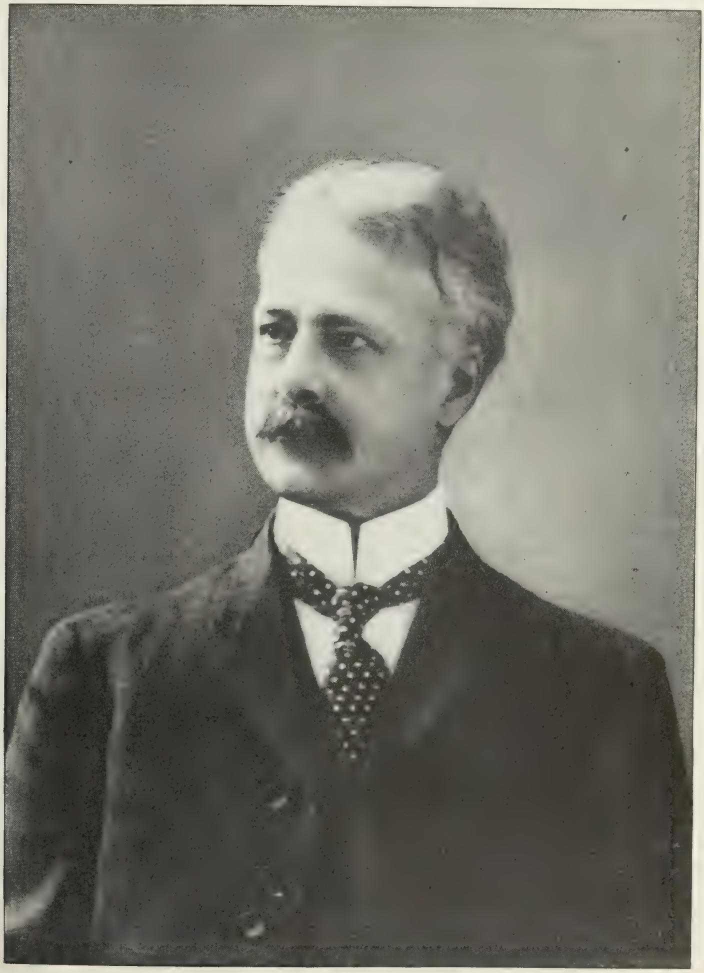
DIED, at his home in Colorado Springs, Colo., October 10, 1916, in his fifty-seventh year, from angina pectoris, after an illness of one day, HENRY BLISS HAYDEN, D.D.S.

Dr. Hayden was born in San Francisco in 1859, but was reared in Massachusetts, to which state the family removed when he was quite young.

During the years 1878, '79, and '80, Dr. Hayden was a student with Dr. S. H. Guilford in Philadelphia, and was left in charge of the latter's practice in 1879-80, at which time Dr. Guilford practiced in Paris for a year. He was graduated from the dental department of the University of Pennsylvania with the class of 1880, receiving high honors. Dr. Hayden conducted a practice in Philadelphia in 1881 and 1882, but after a few years was advised, on account of ill health, to seek a milder climate, and located in New Mexico.

Dr. Hayden had always been devoted to his profession, and was one of its best known members in the Rocky Mountain region. He had served as president of the state and local dental societies, always contributing to the literary and social programs, and was selected as one of the vice-presidents of the Panama-Pacific Dental Congress which was held in San Francisco in 1915.

Dr. Hayden possessed a combination of quiet modesty, warm-heartedness and unusual ability as an operator, which was responsible for the large and satisfactory practice he enjoyed. As a husband and father he was the embodiment of affection, consideration, and unselfishness.



DR. HENRY BLISS HAYDEN.

In the death of Dr. Hayden the profession of Colorado, the city of Colorado Springs, and the entire West have sustained an irreparable loss.

Eight years after his graduation, he was married to Miss Anna Davis of Memphis, Tenn., who survives him, with three sons and a daughter.

Dr. George Emmons Savage.

Died, at his home in Leicester, Mass., December 14, 1916, in his sixty-sixth year, after an illness of nearly three years, from paralysis, Dr. George Emmons Savage.

Dr. Savage, the son of Isaac Rice and Clara (Ball) Savage, was born in Rutland, Mass., January 5, 1851.

His early education was received in the public schools of Paxton, Mass., where he went on leaving Rutland. In 1868 he went to Worcester, where he learned the engraving and die-sinking trade, afterward engaging in the boot and shoe business.

He began the study of dentistry with Dr. Sumner C. Whitney of Worcester in 1881, and commenced the practice of his chosen profession in 1884.

Dr. Savage was a member of the Northeastern Dental Association, and on June 7, 1894, was elected a member of the Massachusetts Dental Society, becoming its forty-third president by election on June 5, 1907. He was a member of the National Dental Association, having been elected in 1899.

Dr. Savage was a delegate to the Fourth International Dental Congress at St. Louis, Mo., 1904, and to the Fifth International Dental Congress at Berlin, Germany, in 1909, being a member of the American committee to forward the work of the congress. On May 5, 1915, he was made an honorary member of the Massachusetts Dental Society.

Dr. Savage's activities were mostly confined to dental societies and all that is embraced in dentistry, and he was a faithful worker in them all, officially and on committees.

He was twice married. In June 1870 he married Miss Winifred K. Morgan, who died in 1878; in April 1897 he married Mrs. Minnie M. Porter Ward. By his first wife he was blessed with two sons, Frederick Lawson Savage, since deceased, and George Arthur Savage, who died April 5, 1914.

Waldo E. Boardman.

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SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS not later than the 11th or 12th of the month preceding that of publication.

University of Iowa, College of Dentistry.

Clinic and Meeting of the Alumni.

The clinic of the College of Dentistry of the University of Iowa and meeting of the Alumni Association will be held in Iowa City, Iowa, March 7 and 8, 1917.

F. B. Whinery, *Sec'y.*

Forsyth Dental Infirmary for Children.

New Department—Library and Museum.

The trustees and director of the Forsyth Dental Infirmary for Children have authorized the creation of a new department, to be known as the "Library and Museum." They solicit from the dental profession contributions of books and dental periodicals, particularly those out of print and not readily obtainable by purchase; also specimens of dental abnormalities, casts, or specimens of unusual structures of dental interest, for all of which permanent acknowledgment will be given.

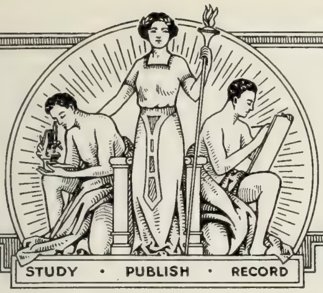
Frederick A. Keyes, D.M.D.,
Librarian and Curator of Museum.

Pennsylvania College of Dental Surgery.

Attention of Class of 1892.

The members of the class of 1892, Pennsylvania College of Dental Surgery, are requested to send their names and present location to the undersigned. The holding of the twenty-fifth anniversary of the class is the object in view.

J. E. Mitinger,
Greensburg, Pa.



NATIONAL DENTAL ASSOCIATION ANNOUNCEMENTS

FROM THE PUBLICITY COMMITTEE.

The National Dental Association will meet in New York City, October 22, 23, 24, 25, and 26, 1917. Headquarters will be at the Hotel Astor, situated on Broadway at 44th and 45th sts. This hotel has the largest ballroom in the world, and this room will be used for all the General Assembly meetings. Other large ballrooms will accommodate the Sections, House of Delegates, etc. The Exhibits will be shown in the beautiful roof gardens. Thus practically all of the meetings will be under the roof of this spacious hotel.

Full accounts of the plans of what promises to be the largest and greatest meeting in the history of the association will be published later. Suffice it for the present to state that the slogan for this year will be

"Quality rather than Quantity."

Nevertheless there will be quantity also. But the important announcement at this time must be the warning—

Reserve your rooms at once. Make reservations by mail direct to the hotel of your choice.

This may seem premature considering the abundance and variety of hotel accommodations listed below. But New York hotels are always crowded. (Nearly seven hundred conventions met here during 1916.) October is one of the busiest months. If you desire to get into any particular hotel, therefore, it will be safest to write at once. For example, 150 rooms have been reserved at the Headquarters hotel, The Astor, already.

Following is a list of hotels:

Hotel—

Astor—Times Square; 1000 rms. (*General and registration Headquarters.*)
McAlpin—Broadway & 34th st.; 1600 rms.
Waldorf-Astoria—5th ave. & 34th st.; 1300 rms.
Biltmore—Madison ave. & 43d st.; 1000 rms.
Manhattan—Madison ave. & 42d st.; 700 rms.
Albemarle—Broadway & 54th st.
Algonquin—59 W. 44th st.; 250 rms.
Ansonia—Broadway & 73d st.; 1600 rms.
Arlington—18 W. 25th st.; 175 rms.
Berkley—170 W. 74th st.; 300 rms.
Bristol—122 W. 49th st.; 180 rms.
Buckingham—5th ave. & 50th st.; 260 rms.
Claridge—Broadway & 44th st.; 250 rms.
Collingwood—45 W. 35th st.; 250 rms.
Cumberland—Broadway at 54th st.; 250 rms.
Earle—103 Waverly Place; 150 rms.
Herald Square—114 W. 34th st.; 310 rms.
Holland House—5th ave. & 30th st.; 350 rms.
Holley—Washington Square W.; 200 rms.
Imperial—Broadway & 32d st.; 800 rms.
Judson—53 Washington Square; 200 rms.
LeMarquis—12 E. 31st st.; 170 rms.
Leonori—Madison ave. & 63d st.; 225 rms.
Majestic—W. 72d st. at Central Park; 700 rms.
Margaret—95 Columbia Heights, Brooklyn; 200 rms.
Marie Antoinette—Broadway & 66th st.; 500 rms.
Martinique—Broadway & 32d st.; 625 rms.
Murray Hill—Park ave. & 40th st.; 600 rms.
Plaza—5th ave. & 58th st.; 750 rms.
Prince George—5th ave. & 28th st.; 750 rms.
Ritz-Carlton—Madison ave. & 46th st.; 425 rms.
St. Margaret—129 W. 47th st.; 130 rms.

St. Paul—60th st. & Columbus ave.
Seville—Madison ave. & 29th st.; 475 rms.
Somerset—150 W. 47th st.; 225 rms.
Vanderbilt—34th st. & Park ave.; 600 rms.
Van Rensselaer—11th st. near 5th ave.; 200 rms.
Webster—40 W. 45th st.; 160 rms.
Wolcott—31st & 5th ave.; 300 rms.
Woodstock—43d st. nr. Broadway; 365 rms.
Woodward—Broadway & 55th st.; 400 rms.

A copy of the list of *Hotels and Rates* in pamphlet form will be sent to any member of the National Dental Association on application. Please inclose stamp.

R. Ottolengui, *Ch'man Publicity Com.*
80 W. 40th st., New York, N. Y.

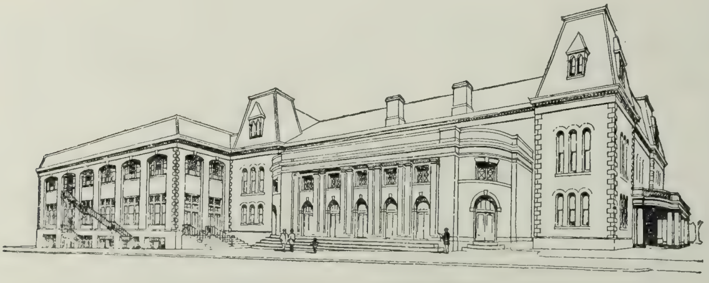
The New Jersey State Dental Golf Association will entertain all golfing members of the National Dental Association, at one of the famous New Jersey courses, during the N. D. A. Convention. All dental golfers bring clubs. Further details later.

S. H. Hinman, *Sec'y.*

Dental Society of the State of New York.

The forty-ninth annual meeting of the Dental Society of the State of New York will be held in Convention Hall, Rochester, N. Y., May 10, 11, and 12, 1917.

Note that the dedication of the Rochester Dental Dispensary—the gift of Mr. George Eastman to the city of Rochester—will take place on Wednesday, May 9th, and the profession is cordially invited.



CONVENTION HALL, ROCHESTER, N. Y.

The Executive Council will meet in Buffalo on the afternoon of May 9th, organize, and then adjourn, to meet in Rochester the following day.

The program of essays and clinics, coupled with other educational features and many forms of entertainment, will make this one of the most successful meetings in the history of the New York Society; in fact, it will be one of the big meetings of the year.

The manufacturers' exhibit will be exceptionally beautiful, and will include practically every up-to-date product, appliance, etc., in the dental trades.

All exhibits, clinics, and meetings will be held in Convention Hall, located in the heart of the city and near the hotels, theaters, and the retail shopping district.

The month of May is exceptionally beautiful in Rochester (the Flower City), which is famous for its beautiful homes, parks, scenery, and extensive gardens.

The officials and members of the New York Society extend to all ethical dentists a most cordial and fraternal greeting to meet with them, together with the assurance that everything possible will be done to make the visit a pleasant and profitable one.

General Business Committee: E. G. Link, *Chairman,* 226 Cutler Bldg., Rochester; Louis Meisburger, Buffalo; Wirt H. Conklin, Rochester.

Programs and general information can be obtained of

A. P. Burkhart, *Sec'y,*
52 Genesee st., Auburn, N. Y.

Texas State Dental Society.

THE Texas State Dental Society will meet in Houston, Texas, April 25 to 28, 1917. Day sessions only.

W. O. TALBOT, *Sec'y-Treasurer,*
Fort Worth, Texas.

Virginia State Dental Association.

THE Virginia State Dental Association will meet in Norfolk, April 17, 18, and 19, 1917. All members of the National Dental Association or any state society are cordially invited to attend.

C. B. GIFFORD, *Cor. Sec'y,*
Norfolk, Va.

Michigan State Dental Society.

DETROIT, the wonder city of the middle West, will be the meeting-place for the sixty-first annual meeting of the Michigan State Dental Society, April 12, 13, and 14, 1917.

The growing necessity for individual efficiency in dental operations should find seven hundred out of the eight hundred members of the society present. "It is for better dentistry."

All ethical dentists are invited to attend and become members, and members of other associations are cordially invited.

C. G. BATES, *Sec'y,*
Durand, Mich.

Missouri State Dental Association.

THE Missouri State Dental Association will hold its fifty-second annual meeting in St. Joseph, Mo., April 4, 5, and 6, 1917. A splendid program is in course of preparation, which will include a number of papers by the strongest men in the dental profession, dealing with subjects of special interest to every dentist.

A first-class clinical program is also in course of preparation, which will include new ideas and new methods of practice. The manufacturers' exhibit will present the newest materials and instruments used in dentistry.

Members of the National Dental Association and all members of state societies are extended a cordial invitation.

J. F. WALLACE, *Sec'y,*
Canton, Mo.

South Carolina State Dental Association.

THE forty-seventh annual meeting of the South Carolina State Dental Association will be held in Columbia, S. C., at the Jefferson Hotel, on May 8, 9, and 10, 1917.

J. T. MONTGOMERY, *Pres.,*
Spartanburg, S. C.
ERNEST C. DYE, *Sec'y,*
Greenville, S. C.

Vermont State Dental Society.

THE next meeting of the Vermont State Dental Society will be held May 16 to 18, 1917, at Rutland, Vt.

P. E. MELLEN, *Sec'y,*
Middlebury, Vt.

Massachusetts State Dental Society.

THE fifty-third annual meeting of the Massachusetts State Dental Society will be held on May 3, 4, and 5, 1917, at Springfield, Mass.

J. ARTHUR FURBISH, *Sec'y,*
Boston, Mass.

Kentucky State Dental Association.

THE next annual meeting of the Kentucky State Dental Association will be held in Louisville the three days previous to the Kentucky Derby, May 9, 10, and 11, 1917. Address all correspondence to

W. M. RANDALL, *Sec'y,*
Louisville, Ky.

Lake Erie Dental Association.

THE fifty-fourth annual meeting of the Lake Erie Dental Association will be held at the Hotel Barlett, Cambridge Springs, Pa., on May 24, 25, and 26, 1917.

D. S. STERRETT,
Erie, Pa.

Pennsylvania State Dental Society.

THE forty-ninth annual meeting of the Pennsylvania State Dental Society will be held in Philadelphia, June 26, 27, and 28, 1917, at the Bellevue-Stratford Hotel.

J. F. BIDDLE, *Sec'y,*
Pittsburgh, Pa.

Postgraduate Dental Meeting:

Alabama, Mississippi, Texas, and Louisiana.

The states of Alabama, Mississippi, Texas, and Louisiana will hold a joint postgraduate meeting on June 4, 5, 6, and 7, 1917, in New Orleans, La. This will be immediately followed by a special detailed technical course, negotiations for which are being made with some of the most talented clinicians throughout the country. The time of the meeting, June 4th to June 7th, besides being a most agreeable season of the year, enables the committee to secure the services of experts in the work to be covered by the meeting, who would not be accessible at an earlier time in the year.

The subjects which will be covered during the meeting proper, by illustrated lectures, moving pictures, and clinics, and which will be given in their entirety, are "Removable Bridge Work," with the most advanced lock and saddle construction. "New Methods of Replacing Lost Teeth Without Mutilation of Sound Members by a System of Saddles, Cast Inlay-fitting Clasps," etc. "Nerve Blocking," including the various phases of local anesthesia. "Radiography." "Root-canal Preparation and Filling." "Apicoectomy." "Treatment of Fractures of the Maxilla and Mandible." "Treatment of the Maxillary Sinus." "Prophylaxis, Periodontia, and Stomatology."

Experts placed in charge of the above subjects will each give special courses, starting immediately after the meeting, and lasting two or three days, or a little longer where the nature of the work requires it. Classes will be formed from among holders of membership cards to the meeting, which none but ethical dentists can obtain. These classes must necessarily be limited in size. Early application for membership and for special courses is urged, and the latter cannot be had without the former. Enrolment in the order of registration. Apply to Dr. C. V. Vignes, chairman Committee on Credentials and Registrations, 709 Macheca Bldg., New Orleans.

The committees representing the four states will conjointly fix membership fees.

The Committee on Publicity, Dr. J. P. Wahl, chairman, 1135 Maison Blanche Building, New Orleans, will shortly issue summaries of the work to be taught by each instructor at the meeting. Arrangements are being made relative to railroad and hotel rates, exhibits, entertainment, clinics and floor arrangements, and will be announced later.

Jules J. Sarrazin, *General Chairman,*
Leo C. Dempsey, *General Sec'y,*
Louisiana Committee.

Tennessee State Dental Association.

Golden Jubilee.

The "golden jubilee" of the Tennessee Dental Association will be held in Memphis, June 19, 20, 21, and 22, 1917. The officers promise the most attractive program ever presented in the South. Social features will be prominent. All ethical dentists invited. Come and bring your wives.

D. M. Cattell, *President,*
C. E. Hines, *Sec'y.*

Susquehanna Dental Association of Pennsylvania.

The fifty-fourth annual meeting of the Susquehanna Dental Association will be held in the Odd Fellows' Temple, 118 N. Ninth st., Allentown, Pa., May 22, 23, and 24, 1917. The high standard of meetings set by the Susquehanna is being kept in mind, and the committee is sparing no effort to make this a meeting which, for benefit and pleasure, will be long remembered.

Odd Fellows' Temple is admirably adapted to our purpose, and easy of access, as you will agree when you have seen it. We think it is superior to any meeting-place we have had.

The exhibits show promise of being better than ever, and will be splendidly taken care of in the spacious auditorium. We have procured eminent essayists and clinicians for the meeting, and promise you some pleasant surprises in a later announcement, giving their names and subjects.

This meeting will be so good that you cannot afford to miss it. If you are in a rut, come and let us help you out of it. Your presence is all that is required to make the 1917 meeting a real success. Cross off the dates in your appointment book now.

Howard S. Seip, *Ch'man Ex. Com.*

North Carolina Dental Society.

THE North Carolina Dental Society will hold its forty-third annual meeting at Durham, N. C., June 27, 28, and 29, 1917.

R. M. SQUIRES, *Sec'y*,
Wake Forest, N. C.

Connecticut State Dental Association.

THE fifty-third annual meeting of the Connecticut State Dental Association will be held at the Hotel Griswold, New London, Conn., June 14, 15, and 16, 1917.

Papers and clinics of unusual interest have been secured, which with the excellent accommodations offered by the Griswold, will make this one of the most attractive meetings in the history of the association.

GEO. S. B. LEONARD, *Sec'y*,
Mystic, Conn.

New Jersey State Dental Society.

THE forty-seventh annual convention of the New Jersey State Dental Society will be held at Atlantic City, N. J., on July 11, 12, and 13, 1917.

The entire convention will be held on Young's Million Dollar Pier. Machinery Hall will be used for the exhibits. Dr. George W. Wakeley of Orange, N. J., is chairman of the committee, and with 25,000 square feet of space available, expects to have the greatest display of dental goods in the history of the society. Machinery Hall extension, with about 10,000 square feet of space, will give ample space for clinics and meetings.

Dr. Charles A. Spahn of Newark, N. J., is chairman of the Clinic Committee, and will present some entirely new clinics. Dr. Raymonde A. Albray of Newark, N. J., chairman of the Essay Committee, has arranged for essayists of prominence, whose names will be announced later.

The headquarters of the society will be on the pier, and mail may be directed to exhibitors, clinicians, or members in care of the secretary of the New Jersey State Dental Society, Young's Million Dollar Pier, Atlantic City, N. J. A list of hotels where special rates may be secured will be published in the *Journal*, and mailed prior to the convention. A cordial invitation is extended to all ethical practitioners.

JOHN C. FORSYTH, *Sec'y*,
430 E. State st., Trenton, N. J.

Massachusetts Board of Examiners.

A MEETING of the Massachusetts Board of Dental Examiners, for the examination of candidates, will be held in Boston, Mass., March 20 to 23, 1917, inclusive. For further information address

GEORGE H. PAYNE, *Sec'y*,
29 Commonwealth ave., Boston, Mass.

New Hampshire State Dental Board.

THE New Hampshire State Dental Board will hold its next examinations on June 28, 29, and 30, 1917, in Masonic Banquet Hall, Manchester, N. H. Application blanks and further information may be obtained of

HARRY L. WATSON, *Sec'y*,
913 Elm st., Manchester, N. H.

Pennsylvania Board of Examiners.

THE next examination of the Pennsylvania Board of Dental Examiners will be held in Musical Fund Hall, 808 Locust st., Philadelphia, and the College of Pharmacy Building, Pittsburgh, on Wednesday, Thursday, Friday, and Saturday, June 13, 14, 15, and 16, 1917. The examination in operative dentistry will be held on Wednesday, June 13th, at 8.30 o'clock, in the Evans Dental Institute, 40th and Spruce sts., Philadelphia, and the University of Pittsburgh Dental Building, Pittsburgh. The examination in prosthetic dentistry will be held on Wednesday at 1.30. Application papers can be secured from the department of Public Instruction, Harrisburg. For further information address

ALEXANDER H. REYNOLDS, *Sec'y*,
4630 Chester ave., Philadelphia, Pa.

National Mouth Hygiene Association.

DEPARTMENT OF EXTENSION LECTURES.

A COMPLETE lecture set, consisting of full manuscript and thirty-six specially selected and prepared lantern slides covering the subject of Mouth Hygiene, is furnished by this association to members of state dental societies and others who may be considered as qualified to present the subject on the lecture platform.

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UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING JANUARY 1917

January 2.

No. 1,210,460, to Thomas F. Glenn. Artificial tooth.

No. 1,210,513, to Eugene F. Medearis. Dental mixing-slab.

No. 1,210,555, to Julius W. Smith. Process in the temporary retarding and suspending the setting of dental cements.

No. 1,210,623, to John C. Feser. Toothbrush.

No. 1,211,244, to Ernst R. Schroeder and Charles M. Miller. Process and apparatus for making porcelain inlays.

No. 1,211,254, to George B. Snow. Condyle indicator.

No. 1,211,304, to Robert E. Farr. Local anesthesia machine.

January 9.

No. 1,211,468, to Wm. J. McLean. Toothbrush handle.

No. 1,211,494 to Wm. F. Shaw. Dental artificial anchor.

No. 1,211,647, to Will P. Walter. Apparatus for administering anesthetics.

No. 1,211,712, to James E. Keefe. Dentifrice.

No. 1,211,749, to Walter W. Oswald. Artificial tooth.

No. 1,211,817, to David Wm. Blundell and John Henry Mills. Artificial tooth.

No. 1,211,944, to Ernest A. Hussar. Art of forming plates for artificial teeth.

No. 1,212,001, to Harry T. Baxter. Toothbrush.

No. 1,212,010, George L. Brown. Toothbrush.

No. 1,212,016, to Theodore T. Cater. Dental vulcanizer attachment.

No. 1,212,138, to Albert O. Glasgow and Edward L. Acker. Combined toothpaste squeezer and brush holder.

January 16.

No. 1,212,335, to Arthur Feinberg. Toothbrush holder and sterilizer.

No. 1,212,373, to George H. Love. Toothbrush.

No. 1,212,645, to Arthur L. Kane and John J. O'Neil. Toothbrush holder.

No. 1,212,725, to George M. Wolfe. Mold for vulcanized rubber dental plates.

No. 1,212,885, to Coldwell C. Beebe. Artificial tooth.

No. 1,212,935, to Thomas F. Glenn. Artificial tooth.

January 23.

No. 1,213,235, to Paul D. Meiers. Cover for toothbrushes.

No. 1,213,289, to Samuel Soloff. Dental waste receiver.

No. 1,213,587, to Wm. E. Chester. Removable artificial dental crown.

No. 1,213,667, to Caleb W. McKinney. Tooth-cleaning implement.

January 30.

No. 1,214,197, to James B. McAllister. Dental pliers.

No. 1,214,362, to Arthur L. Paschall. Dental floss holder.

DR. JAMES G. LANE.

THE
DENTAL COSMOS

VOL. LIX. APRIL 1917. No. 4.

ORIGINAL COMMUNICATIONS

Electro-sterilization of Root-canals.

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(First Paper.)

INTRODUCTION.

THE most serious question that confronts the dental profession today—and for that matter confronted it in the past—is that which is involved in the problem of establishing absolute sterility of an infected root-canal. The disposal of this problem in a truly scientific manner necessitates the determination of established sterility by bacteriologic tests in each individual case. While the writer realizes that the carrying out of such procedures in the average dental office of today will meet with numerous difficulties, due to the fact that the older members of our profession have not had sufficient training in these directions, nevertheless there exists no valid reason why it should not be done for the practitioner through a laboratory. The time is not far distant when the public will demand a laboratory diagnosis of serious root-canal infections for the same reason that a bacteriologic examination of a diphtheritic throat is demanded at present. Since the sequences of imperfect root-canal sterilization in the form of focal infections resulting in metastatic disturbances of distant organs are of common occurrence, it needs must follow that our present methods of establishing perfect sterility of a root-canal are inadequate.

The treatment of an infected root-canal resolves itself into three definite phases—the mechanical, the chemic, and the therapeutic procedures. Mechanical manipulations are intended to dispose of the débris of the dead pulp, chemic procedures are primarily applied for the purpose of removing obstructions, and therapeutic applications are utilized to overcome septic conditions. For the latter two procedures some of the most powerful chemicals and drugs at our command are employed. Callahan, in 1893, advocated the use of 50 per cent. sulfuric acid—other investigators suggested 10 per cent. hydrochloric or even pure nitro-hydrochloric acid—for the enlargement of obliterated root-canals, and Kirk, in 1894, recommended the use of sodium dioxid in conjunction therewith. As an initial step, these combined procedures constitute the very foundation of successful root-canal treatment from a chemic point of view, and they should, as a matter of routine, be employed in every case. Experimental proof of the soundness of this conception and long-extended clinical observations substantiate this claim.

Soon after the inauguration of the antiseptic era in surgery, in 1868, by Lister, dentistry adopted his methods for the treatment of root-canals in an empirical way by using phenol as advocated by Witzel, in 1873. Since then innumerable drugs and drug compounds have been recommended at various times for this purpose. From a clinical point of view the cresol-formalin mixture as introduced by Gysi, in 1899, and which was widely popularized by Buckley, in 1904, has received greater approval than any other medicinal compound recommended for such purposes. The true criterion of the efficiency of an antiseptic is its bacteriologic test. The high standard of germicidal activity of formalin has been frequently established by rigorous experiments. Clinical data collected in the early days of the use of the above mixture pointed to most favorable results. In due time, however, it was observed that while "clearing up" of an infected root-canal, as far as the ordinary diagnostic evidence is concerned as applied in the average dental office, *i.e.* absence of foul odors, occurred much more rapidly by the use of this mixture than by employing any of the numerous other drugs usually advocated for this purpose, nevertheless secondary manifestations about the periapical tissues were of frequent occurrence. These disturbances are an indication that the supposed sterility of the canal was not obtained at the time of its treatment by the cresol-formalin mixture, or that this compound produces a predisposition of the periapical tissues to future infections. To be sure, dental literature is pregnant with statements such as this (referring to the cresol-formalin mixture): "This dressing should remain for at least three days, by which time the remedy will have sterilized the entire tubular structure of the dentin, thus establishing asepsis." As no bacteriologic proof is furnished to substantiate the claim, this empiric statement does not carry any scientific weight, honest as its intention may have been.

Much stress has been placed in the past on the nature of the root-canal filling material. As a matter of fact, the discussion of root-canal treatment in current literature centers almost exclusively about the filling of the canal, and less so about the means of obtaining its sterility. Artistic root-canal fillers will display roentgenograms "before" and "after" the operation, claiming that *now*, as the picture shows, a perfect root-canal filling obliterates the entire canal. These men seemingly forget that they have filled only the largest tract of the deltoid branches of the root-canal within the apical region, and that the half dozen, more or less, additional ramifications have escaped their notice. And it is in these smaller canals, unless the entire region is definitely sterilized, that bacteria are harbored to await a suitable opportunity for propagation. A sterile root-canal filling acts as a "mechanical" antiseptic; its intention is to hermetically seal up that space of the tooth which at one time has been occupied by the pulp. If our root-canal fillings were a perfect replica of the former pulp, no further trouble would be anticipated. The numerous recurrent infections, however, tell a different story.

On the other hand, if we start out with a sterile root-canal and can furnish proof that the dentin to the depth of one or two millimeters is sterile, especially so within the apical region, which is the primary seat of infection and of reinfection, our root-canal fillings placed with care and precision will furnish a greater percentage of "successes" than if primarily we start out with a root-canal of questionable sterility. Any new method, therefore, which promises to possess superior merits over existing less satisfactory procedures, is worthy of discussion. The writer is convinced that the process of electro-sterilization of infected root-canals as a means of establishing asepsis is an advance step in dental therapeutics, and is deserving of earnest consideration by the clinical practitioner.

INFECTION AND REINFECTION OF THE PULP.

Before entering upon a detailed discussion of the subject proper, it is imperative to have a clear conception of the nature of the infection and the reinfection as far as it is related to the root-canal.

Dental text-books are wofully meager in furnishing information on this all-important subject, and incidentally, the little information obtained therefrom frequently portrays utter disregard of principles of general pathology. When, for instance, a teacher in a dental college advocates in a widely read text-book syrup of sarsaparilla containing a few grains of potassium iodid "to aid nature in readjusting the abnormal condition . . . . in these cases of septic pericementitis or incipient abscess," and another writer faithfully copies this statement in a recent dental publication of his own, presumably in the belief of the dose acting as a "blood purifier," it merely verifies what is stated above, namely, that the underlying facts of general pathology are not comprehended. The weakest point in the present curriculum of the average American dental college is the deficient teaching of the fundamental principles of general pathology. By the teaching of general pathology the writer wishes to imply a comprehensive presentation of the subject in the lecture room and in the laboratory from its broadest viewpoint as taught at present in our best medical schools, and not that heterogeneous mixture of facts and fancies generically referred to as dental pathology. It is to be hoped that with the inauguration of the four years' course those who shape the destiny of dental education will accredit to general pathology—the indispensable foundation of the practice of medicine and surgery in all its branches, including dentistry—that consideration to which it is justly entitled.

Concerning the general nature of infection, it should be kept clearly in mind that the process involves two definite factors, *i.e.* the body cell to be infected and the infecting virus. Incidentally, the surrounding media also play a most important part in the struggle for supremacy.

Relative to the infection of the human tooth pulp, numerous attempts have been made in the past to isolate the specific micro-organisms causing its death. In the early days of oral bacteriology, the late W. D. Miller (1889) had isolated an organism which he termed bacillus pulpæ pyogenes. Schreier (1893) claimed that Miller's bacillus was a pneumococcus. Arkövy, in 1898, announced that he had isolated a specific organism, the bacillus gangrænæ pulpæ, and Cook (1899) spoke of a bacillus putrificus cadaverus as the cause of pulp infection. Sieberth, in 1900, rehearsed the whole question experimentally, and he claims that in over 90 per cent. certain types of streptococci are the sole factors concerned in pulp infection. The most important work relative to the nature of pulp infection was carried out by Mayrhofer in 1909. From a very large amount of experimental data he drew certain conclusions which he tabulated as follows:

Organisms found—	
Streptococci	70 times.
Streptococci and rods	44 "
Streptococci and stapylococci	14 "
Streptococci, staphylococci, and rods	10 "
Streptococci and yeast cells	5 "
Streptococci, rods, and yeast cells	3 "
Staphylococci	3 "
Staphylococci and rods	1 "
Rods	2 "

The various types of streptococci as isolated from pulp gangrene are apparently closely allied to the streptococcus viridans of Schottmüller; at least the reports of recent experimental work as carried out by Gilmer and Moody, Rosenow, Hartzell and his co-workers, and others, point in this direction. From the evidence as set forth in the above review it seems all but certain that the source of pulp infection is practically a streptococcus bacteriemia. "The streptococcus viridans may be isolated from the blood, and is characterized by the fact that in culture media . . . . it may be converted, as shown in the immunological studies of Rosenow, into any of the other types of the members of the streptococcus-pneumococcus group." (Billings.)

The final dissolution of the dead pulp results from the presence of proteolytic ferments which are secreted by the leucocytes. These latter cells are attracted to the seat of disturbance in enormous quantities by chemotaxis. The pus corpuscles themselves are polynuclear neutrophilic leucocytes which have migrated from the bloodvessels to the seat of infection. The liberated leucocytic ferments digest the dead pulp, the process being known as autolysis. Incidentally, with the secretion of these autolytic ferments, the body, for its own protection, releases anti-ferments, as for instance, in the normal production of anti-pepsin in the stomach wall for the purpose of preventing its own digestion.

During the necrobiotic changes within the living pulp or after its complete demise, the periapical tissues of the tooth may become involved. Putrid particles of tissue may be forced into the pericementum through pressure of gases evolved during its decomposition, through manipulation in the root-canal by the operator, or otherwise. The irritated pericementum protects itself against the invading foe by a vital response, *i.e.* a reactive inflammation. If the normal defenses of the organism are superior to the foe, a wall of protection will be established by the irritated tissues, resulting in encapsulation of the disturbing elements; this is known as an alveolar abscess. Nature intends to free herself of the contents of the abscess cavity by establishing an outlet along the line of least resistance, whether through the root-canal or through the bony wall of the alveolus by means of a fistula. If the established pericementitis assumes a chronic character, nature further fortifies herself by building up a heavy wall of granulation tissue, known as granuloma. This granuloma, for the time being, may protect the body against general infection. At the slightest provocation, however, it may be by over-exertion, a cold, increased blood pressure, lowered vitality, or some other existing cause, the dormant infection may flare up and assume a most virulent type, resulting in the so-called subacute abscess. Basing our conception upon this supposition we may find an explanation of how these obscure secondary abscesses occur about devitalized teeth which have at one time been pronounced cured. On the other hand, if the tissue defenses succumb to the products of the streptococcus bacteriemia, general infection with all its sequences may occur. "The focus of infection which undoubtedly causes the streptococcus bacteriemia and chronic malignant endocarditis is often alveolar abscess. Of this we have had numerous clinical examples. Coincident cultures from the alveolar abscess and from the blood have yielded strains of streptococcus viridans. When these nascent cultures were intravenously injected into animals, typical endocardial lesions resulted." (Billings.) Acute rheumatic fever, pericarditis, nephritis, arthritis, and many other acute and chronic diseases are known to have derived their origin in focal infections about the teeth.

Reinfection of root-canals which at one time had been pronounced cured are very common. The important question "How did this reinfection occur?" has never been fully explained. Four possible modes suggest themselves. The reinfection may start by gaining entrance into the filled canal from the pulp chamber; it may occur via the circulation; it may pass along the pericementum from the gingival margin, or it may take place from organisms left in the canal or in the dentinal tubuli. The first route is rather difficult to imagine, especially when the root-filling, which is naturally more perfect near the pulp chamber, is covered by a layer of oxychlorid cement. This cement offers an effective barrier against reinfection. Secondary invasions of necrotic areas about the apical regions of pulpless teeth through hematogenous systemic infection do occur in the same manner as, reversely, they are observed in other organs of the body from focal infections. These necrotic areas are most frequently produced by the use of powerful penetrating caustic antiseptics, such as formalin, for instance, when employed in root-canal treatment. Formalin in the strength in which it is usually applied for such purposes will always kill the soft tissues when brought in contact therewith either directly or in vapor form in the same manner as the ill-fated desensitizing paste by its formalin content kills the pulp. Formalin preparations are contra-indicated for the treatment of infected root-canals.

Reinfection of the root-canal from a marginal pericementitis which by continuity spreads toward the apex does occur. Such cases are comparatively easily diagnosed. The greatest majority of secondary infections find their origin in the presence of micro-organisms left in the dentinal tubuli, and which have escaped destruction during the supposed process of sterilization. It should be remembered that one solitary organism left unharmed may be responsible for a most virulent reinfection, as the power of reproduction of bacteria is enormous. (As Miller has estimated, one single cell may produce 16,000,000 offspring within twenty-four hours.) The reinfection naturally occurs primarily about the apical end of the root, and as these reinfections are of very common occurrence, as our daily experience teaches, it merely follows that our present methods of root-canal sterilization are imperfect.

HISTORY.

The utilization of the electric current for the purpose of checking bacterial growth is by no means of recent origin. In 1883 Cohn and Mendelsohn employed a galvanic current experimentally to study its effect upon bacteria suspended in nutrient solution. Apostoli and Laquerrière, in 1890, used a current of 100 to 150 milliampères for similar purposes, claiming, however, that it is not the current as such but the electrolytic decomposition of the nutrient fluid which produces the desired effects. Similar results were obtained by Prochowink and Spaeth in the same year. In 1891 Versoogen claimed that the bactericidal effect of the current depended on the end products of the electrolytic dissociation of a suitable fluid, *i.e.* acid at the positive pole and alkali at the negative pole. The application of this principle for the purpose of sterilizing root-canals was probably first attempted by Breuer of Vienna, who, as early as 1890, referred to this method in a tentative manner. In 1895 Rhein, at the suggestion of Morton, employed this procedure in an empiric way with apparent good success; he again demonstrated it in 1897, and has referred to it at various times ever since. A systematic investigation of this procedure was first attempted by Bethel in 1896–97, and an examination of his publications is of the highest interest. However, it remained for Zierler to furnish a detailed account of the nature of the action of the galvanic current on bacterial infection of root-canals, and his work, carried out in conjunction with Lehmann at the University of Würzburg, in 1900, must be regarded as a very complete *exposé* of the procedure. Since then quite a host of writers have elaborated on this problem, among whom Hoffendahl, Miller, Peter, J. Forbes Webster, Frank D. Price, Sturridge, and many others should be mentioned. The English-reading dental profession is particularly to be congratulated on the excellent discussion of this procedure as recorded by Sturridge in his commendable work "Dental Electro-therapeutics," and a careful perusal of this volume is earnestly recommended.

TERMINOLOGY.

The term ionization as applied to the specific purpose of electro-sterilization of root-canals is ill chosen. Ionization designates purely a chemico-physical process, *i.e.* by the phenomenon of electrolysis ions are induced to migrate. Again, the term ionic medication is employed for such procedures. Lewis Jones defines it as follows—"Ionic medication is a method of treatment in which electric currents are used for their power of setting the constituents of a saline solution in orderly motion in a definite direction. It is used for the introduction of drugs into the superficial parts of the body through the surface." While the above explanation is compatible with the nature of ionic medication for general medicinal purposes, it does not specifically designate the end for which this procedure is applied in the treatment of root-canals. Our sole object in applying this treatment consists in combating infection by the most powerful method known, *i.e.* sterilization. The latter is induced by a weak electric current through the migration of certain ions. Hence the term sterilization by electrolysis, or in short, electro-sterilization, as first suggested by Zierler, is eminently suitable for this purpose, and its general adoption is strongly urged by the writer. It has been suggested that the term electro-sterilization merely indicates a substitute for the once famous therapeutic procedure known as cataphoresis. This conception is not correct. Cataphoresis designates the mechanical movement of suspended molecules by means of the electric current. As such it is a process independent of electrolysis. The rationale of electro-sterilization depends on the interaction of two definite processes —(1) the dissociation of a suitable chemic compound in a solvent (electrolyte) into ions, and (2) the movement of these ions in the direction of specific poles within the tissues, brought about by the passage of a weak galvanic current.

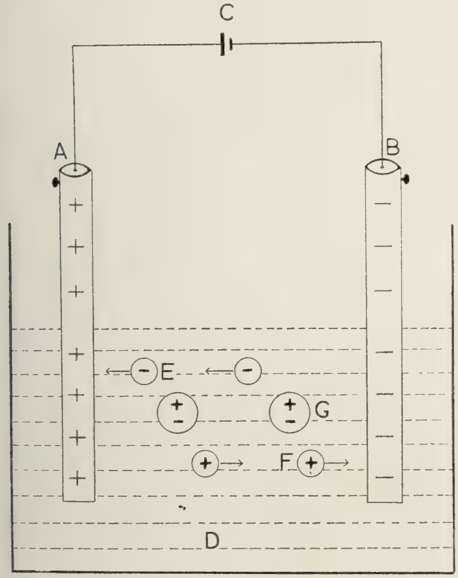
THEORY OF ELECTROLYTIC DISSOCIATION.

When a solid, liquid, or gas enters into solution and is capable of conducting an electric current, according to Arrhenius, the solution undergoes certain changes which are grouped under the generic term electrolysis. This latter term and the following nomenclature was introduced by the English physicist Faraday (1791–1867) and is still universally employed. The solution itself is known as the electrolyte, while the dissociated products are referred to as ions. The terminals at which the electric current enters or leaves the electrolyte are called electrodes. An ion (ion = *going*) may be referred to as being the dissociated product of a chemic decomposition which is capable of conducting an electric charge and which travels in the direction of an oppositely charged pole. Those ions which are charged negatively migrate to the anode, *i.e.* the positive pole, and are known as anions, while the positively charged ions migrate to the negative pole, the cathode, and are known as cations. Relatively speaking, all metals, alkaloids and hydrogen, are positive ions, *i.e.* cations, while all acids, bases, halogens, hydroxyl compounds, and oxygen are negative ions, *i.e.* anions. As Ostwald has suggested, the cation may be designated by the positive sign $^{+}$ or by $^{\cdot}$, and the anion by the negative sign $^{-}$ or by $'$. "An ion may be either a charged atom, as in the case of the silver ion, or a charged group of atoms, or molecules. In the case of silver nitrate, $AgNO_3$, the cation is Ag, and the anion is the molecule or radical NO_3. The charge of the NO_3 ion is one negative unit, and that of the Ag ion is one positive unit, as both the ions are monads, or monatomic." (Lewis Jones.)

A simple solution of salt in water dissociates the salt into electro-molecules, the ions, which exist independently of the action of a galvanic current. The number of positively and negatively charged ions is equi-molecular, *i.e.* the solution is electrically neutral. The ions themselves are suspended in the solution in a chaotic mixture. The passing of the galvanic current, according to Nernst, by its electro-motive force causes a definite movement of the ions in an orderly direction to their specific centers of attraction—*i.e.* respectively to the positive and the negative pole.

The nature of the movement of ions may be thoretically explained, according to Nernst, by the following schematic drawing. (Fig. 1.)

FIG. 1.



Scheme showing the movement of ions.

According to the above scheme, if we charge two zinc electrodes, A and B, suspended in a zinc chlorid solution, D, from a battery C, the positive zinc ions, F, are attracted to the negatively charged electrode, B, and slowly they move in the direction of this pole, and there discharge their positive charge, thereby releasing the negatively charged electrode. The discharged zinc ions are now formed into ordinary metallic zinc. The positively charged electrode, A, attracts the negatively charged chlorin ions, E; the latter discharge themselves and dissolve metallic zinc, forming zinc chlorid, which at once is again ionized. The resultant ions—zinc and chlorin—are dispersed in the solution. Undissociated molecules, G, of zinc chlorid present in the solution are not acted upon by the current. The movement of these ions occurs comparatively slowly and may be accurately measured by means of an ingenious apparatus devised by Kohlrausch.

Experiment: Ionization.

(1) Moisten a piece of starch-iodid paper with water. Apply the two poles about one inch apart. A blue spot will develop under the positive pole. The iodid salt is ionized, and the liberated iodin colors the starch blue.

(2) Moisten a piece of cotton with a weak solution of potassium ferricyanid. The positive pole of the battery consists of a piece of clean iron wire. After the battery is turned on, an intense blue color, Prussian blue, *i.e.* iron ferrocyanid—appears at the positive pole.

The degree of concentration of the solution to be ionized has no effect upon the number of ions produced; the latter depends upon the strength of the current multiplied by the time for which it is applied. In other words, ionization is a manifestation of transformed electric energy in accordance with Faraday's law: "The amount of decomposition of an electrolyte is proportional to the amount of electricity which flows through it."

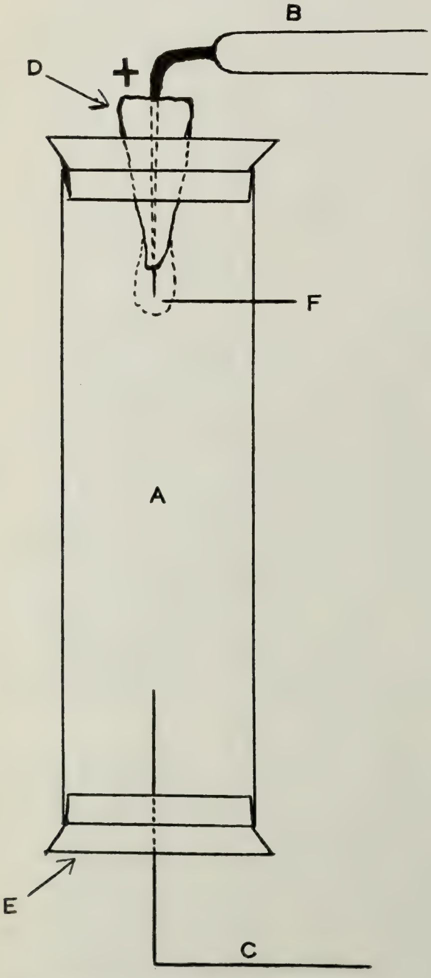
The process of electro-sterilization of infected root-canals concerns itself primarily with the disinfectant action of the liberated ions, and less so with their supposed medicinal qualities. The disinfectant action is principally confined to the surface of the object treated, although a certain depth of penetration is desirable. According to Sir Oliver Lodge, chlorin, the principal agent depended upon in root sterilization, develops a velocity of penetration amounting to 2.16 mm. per hour for a drop of potential of 1 volt per cm.

Experiment: Movement of Ions.

(1) A saturated solution of copper sulfate is placed in a small beaker to

the depth of one inch. An insulated piece of copper wire, having one-half inch exposed at each end, is placed into the solution and united to the negative pole. A similar piece is hung over this solution and united to the positive pole.

Fig. 2.



Experiment showing passage of ions.

A $\frac{1}{2}$ per cent. sodium chlorid solution is carefully flowed over the copper solution by means of a pipet. The current is turned on, and slowly the blue cupric ions are seen moving into the colorless sodium chlorid solution.

(2) A glass tube, three inches long and one-half inch in diameter, is filled with an alkaline 10 per cent. gelatin solution containing 1 per cent. of sodium chlorid and colored pink with phenol-phthalein. Insert a cork carrying a platinum wire at each end, and unite the wires to the two poles. In due time the pink color will disappear near the positive electrode, indicating the movement of the chlorin (hydrochloric acid) ions.

(3) Repeat the above experiment, but substitute for the wire of the one cork a tooth having a gangrenous pulp. (Fig. 2.) The débris of the pulp is removed, and the broach passed through the foramen. The canal is filled with salt water and the iridio-platinum electrode—positive pole—is inserted into the root-canal, passing slightly beyond the foramen. Apply a current of 5 milliampères for six minutes. Notice the discolored zone near the foramen of the tooth, which becomes more definitely outlined within the next twenty-four hours. Remove the tooth and split it open. Notice the odor of chlorin and the bleaching effect on the surface of the root-canal.

(4) Place a positive pole of zinc and a negative pole of copper into a weak solution of zinc chlorid. Within a few minutes the negative copper pole will be coated over (plated) with metallic zinc.

SUPPOSED ANTISEPTIC ACTION OF THE ELECTRIC CURRENT AND OF METALS.

The electric current *per se, i.e.* at least in the strength suitable for root sterilization, does not produce any measurable bactericidal action. A weak current passed for hours through diluted sulfuric acid prior to entering an inoculated Petri dish did not inhibit the growth. (Lehmann.) In the presence of an electrolyte, the current acts on the dissociated ions of the latter, and, depending upon their specific chemic nature, some of the most powerful disinfectants may be obtained. It is claimed that certain pure metals as such possess slight antiseptic action. This property was first observed by the late Professor Miller. According to Behring, this antiseptic action is the result of the reaction of certain waste products of bacteria, primarily lactic acid, with those metals which are capable of forming soluble salts, and which diffuse through the medium. This antiseptic action of metals must not be confounded with the oligodynamic action of certain pure metals in their colloidal state, as copper, for instance, on low-type plant cells. Of the pure metals, according to the classic experiments made by Thiele and Wolf, mercury, silver, and copper are the only ones which produce poisonous salts in the presence of bacteria, while the other tested metals, *i.e.* platinum, palladium, gold, aluminum, magnesium, zinc, lead, tin, and iron are wholly devoid of action. In the discussion of electro-sterilization of infected root-canals great stress is frequently laid by certain men upon the specific nature of the metallic electrode placed in the root-canal as being *the* factor which produces the desired germicidal effect. Rhein, for instance, insists on using a chemically pure zinc electrode in the presence of a sodium chlorid solution, claiming that "nascent zinc chlorid" is formed during the process of electrolysis. Other practitioners employ a copper electrode and a weak zinc chlorid solution as a substitute for the sodium chlorid solution. A zinc electrode employed for electro-sterilization of root-canals is not only devoid of any germicidal action, but it is also an ill-chosen metal for this purpose, because a zinc wire is too brittle to be filed fine enough so as to readily enter a minute root-canal without inviting danger of breaking.

Ionization of a metallic electrode occurs primarily in the presence of a suitable electrolyte, *i.e.* a solution of a salt of the metal of the respective electrode. While theoretically it is true that ions of the respective electrode must be produced as a secondary sequence of the primary ionization of the electrolyte, *practically*, in employing the low ampèrage tolerated by the human body these ions are *not* demonstrable with the ordinary chemic reactions, consequently they cannot exercise any therapeutic effect. A zinc electrode in the presence of a sodium chlorid solution is *not* ionized in the short space of time and with the low ampèrage employed in the electro-sterilization of root-canals, consequently "nascent zinc chlorid" ions, which Rhein believes to have been produced from his zinc electrodes, are imaginary therapeutic bodies; such ions do not exist. When a high ampèrage is employed—in experimental work outside of the human body—sufficient hydrochloric acid is obtained as a secondary product which will act on the zinc pole, forming zinc chlorid.*

Experiments:

(a) *To show the non-existence of zinc ions in the presence of a sodium chlorid electrolyte.*

(1) The positive zinc electrode and a negative copper electrode are placed about an inch apart in a dish filled with a 1 per cent. sodium chlorid solution. A current of 5 milliampères is passed through the solution for 6 minutes. The addition of ammonium sulfid does *not* reveal the presence of zinc in solution. By adding one drop of a weak zinc chlorid solution, the presence of metallic zinc is at once manifested.

(2) Repeat the same experiment as above, but substitute the zinc electrode by a silver electrode. No precipitation of silver chlorid occurs, consequently *no* silver ions are formed.

(b) *To show the existence of zinc ions in the presence of a zinc chlorid electrolyte.*

The positive zinc and the negative copper electrodes are placed in a dish filled with a 1 per cent. zinc chlorid solution, and the current is applied as above. In a few minutes the copper electrode is completely covered by a coating of zinc,

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* During the past year the writer has experimented with organic and inorganic metal salts in connection with electro-sterilization. The results of these experiments are as yet too incomplete to allow specific deductions to be drawn therefrom; nevertheless they point in a direction which strongly encourages their further pursuit.

i.e. it is "zinc-plated." If the zinc electrode is carefully weighed before and after the experiment a ponderable difference of this zinc electrode is demonstrable.

To cite the oft-repeated experiment of placing copper electrodes into a hard-boiled egg and then passing a current through it and thus producing green-colored copper compounds near the positive pole as a proof of the ionization of copper, is by no means a counterproof of what we have stated above, but rather supports our contention. The coagulated albumen, of course, does not represent albumin as present in the tissues. If a comparison is to be drawn from this experiment, fresh egg-albumin should be used instead. By passing a current through it, it will be seen that green-colored copper compounds are formed about the positive pole, and coagulation (by heat) occurs near the negative pole. Albumen is a highly complicated amphoteric electrolyte, *i.e.* it represents multi-basic acids and multi-acid bases, hence the reaction. This holds equally good for gelatin solutions, although they are more pronouncedly acid in reaction.

Copper or silver wires may be used as positive poles in electro-sterilization. They are inferior, however, to iridio-platinum, because in the presence of suitable electrolytes they are ionized, *i.e.* destroyed, and incidentally they discolor tooth structure. Pure platinum is not measurably altered by the process of electrolysis, but it is too soft for our purpose. An alloy of iridio-platinum possesses the ideal qualifications regarding adaptability and durability as a root-canal electrode, and it is therefore strongly recommended by the writer as the most suitable metal for the purpose in view.

The variability of resistance of the human body to the passing current naturally materially influences its therapeutic effects. Taking into consideration the distance between the two poles, the respective biologic nature of the tissues, and other factors, it may be stated that, in round figures, the human body offers a resistance which equals from 5000 to 100,000 ohms. In a pulpless tooth the root-canal of which is filled with salt water for the purpose of electro-sterilization, the resistance is low, *i.e.* only a few volts are required, while if a tooth is previously deprived of its natural moisture or if its foramina are closed, an enormously high voltage, *i.e.* up to the full capacity of the current, is required to force its passage laterally through the dentin.

(c) *To show the depth of the penetration of ions into the dentin in a tooth with a closed foramen.*

A tooth whose foramen is tightly closed by gutta-percha, and the apex of which is dipped into melted paraffin, is filled with silver nitrate solution; the positive electrode consists of a piece of pure silver wire. The tooth is suspended in a sodium chlorid solution up to within a quarter inch of its gingival margin. Usually, the full voltage of the current is required to register one milliampère of flow. Slowly the ampèrage increases to about 4 M.A. After about ten minutes the current is turned off, the tooth is removed, washed, and sections are cut. Under the microscope, the penetration of the silver nitrate can be observed only to the depth of a few millimeters. No precipitation of silver chlorid takes place in the salt water. The same experiment repeated with an iron electrode in the presence of a potassium ferricyanid solution showed only the very faintest trace of Prussian blue upon the inner wall of the canal.

A most naïve explanation—"to show the antiseptic or germicidal properties of zinc ions"—is furnished in a recent paper by J. Forbes Webster. He says:

> To show the antiseptic or germicidal properties of zinc ions, three U tubes, *a*, *b*, *c*, were taken, and a small quantity of ordinary broth medium (which contains meat extract, peptone, and NaCl) was introduced into each. Each tube of broth was lettered and then inoculated with some saliva. *a* was kept as a control. *b* was connected with a battery, the anode or positive pole being a small piece of pure zinc. A current of 15 to 20 M.A. was passed for 25 minutes. *c* was used as a control to *b*, being connected to the battery

in the same way, but no current passed. The three tubes were then put in the incubator for 24 hours. *a* and *c* showed abundant growth, but no growth was visible in *b*, nor could sub-cultures be obtained from *b*. This goes to prove that the zinc ions had sterilized the broth.

Webster's deductions are based upon insufficient chemical knowledge. Aside from the statement, "This goes to prove that the zinc ions had sterilized the broth," no real proof is furnished to substantiate his claim. The true nature of the sterilization as demonstrated by this experiment is found in the fact that the current has ionized the sodium chlorid present in the broth. If Webster had substituted a platinum wire, which is *not* ionized, for his zinc electrode, he would have been surprised to obtain identically the same results.

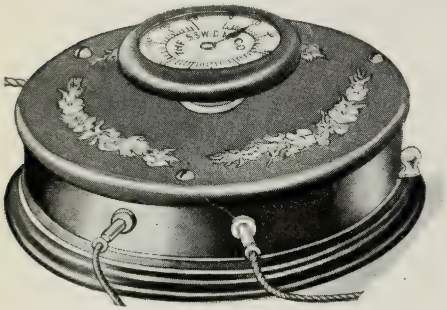
Webster cites a second experiment: "To show that the zinc ions pass through the tissues, I devised an experiment by passing the ions through coagulated albumen." He describes in detail the apparatus employed, stating that—"The negative electrode consisted of a platinum wire leading to a pledget of cotton wool moistened with a normal saline solution. The zinc electrode was then carefully brought in contact with the coagulated albumen," etc. He claims that "No growth was obtained, which goes to prove that the zinc ions had passed through the coagulated albumen and sterilized the broth." If Webster had left out of this experiment "a pledget of cotton wool moistened with normal saline solution," his "zinc ions" would have never sterilized his broth.

THE ELECTRIC CURRENT AND ITS ACCESSORIES.

The only current suitable for electro-sterilization is the direct current. The alternating current as such cannot be used unless it is changed by a transformer. This may be accomplished by a chemic "rectifier" or a small motor dynamo. The chemic rectifier without potential equalizer has not been found satisfactory by the writer. The source of the current may be obtained from the main line, from an accumulator or a storage battery, or from a series of cells. If the street current is used, it must be reduced by a rheostat to about 30 to 40 volts. A number of lamps, mounted in series, one lamp of sufficiently high voltage, or a wire rheostat, is usually employed for this purpose. An ordinary switchboard is less suitable, as there is always danger of shocking the patient through imperfect control. If the street current is used a knife switch should be interposed between the rheostat and the current controller. If cells are employed—and many practitioners and most of the reliable electric supply houses regard a cell series as the safest means for the purpose in view—about 18-24 Leclanché wet cells or an equal number of ordinary dry cells (Columbia No. 6) are most useful. The silver chlorid cell is less serviceable for our purpose. An ordinary wet or dry cell furnishes approximately a little over one and one-half volts. Recently, compact types of dry-cell batteries furnishing a current of very low ampèrage and medium voltage, intended for wireless telegraphy, have been placed on the market. These cells are also useful for dental electro-sterilization. The cells are mounted in series, and connected to binding-posts. From these posts the current is conveyed by means of flexible conducting cords of specific colors to a suitable controller. The most important feature of a serviceable controller consists in the gradual increase or decrease of the current in very small fractions of a milliampère without shocking the patient. A graphite or a series wire rheostat, either plain or as a shunt, is serviceable for such purposes. The markings on the current controller (Fig. 3), be they volts or arbitrary numbers, have little bearing on the practical application of the current.

The current controller, in turn, is connected with a milliampèremeter, an instrument for measuring the quantity or strength of the current. The milliampèremeter is *the* instrument of precision which guides the operator in his work, consequently too much emphasis cannot be placed upon the importance of obtaining a perfect working instrument.

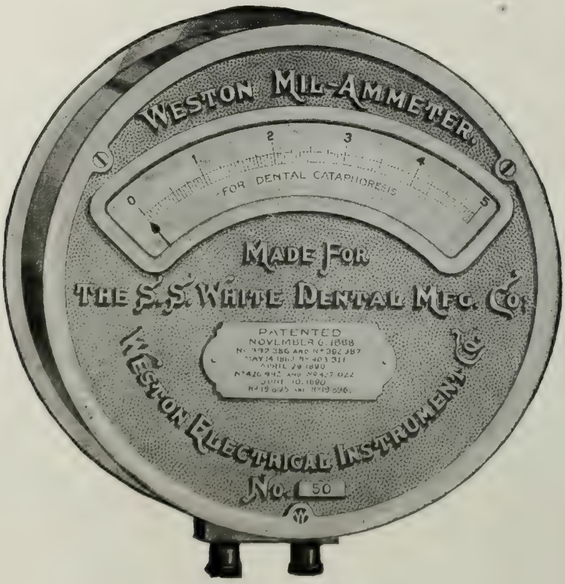
Fig. 3.



The S. S. White current controller.

At this point the writer may be permitted to digress for a moment from the subject proper and call to the mind of the reader the fundamental nomenclature governing electrical measurements—as far as it is utilized in the following discussion. By the term ampère we mean the unit of strength of a current. A milliampère is a thousandth part of an ampère, expressed as M.A. A volt is the measure of the unit of pressure of the current, *i.e.* the electric power necessary to drive a current of one ampère through a resistance of one ohm. It is referred to as the electro-motive force and expressed as E.M.F. An ohm measures the resistance of a circuit through which a current flows.

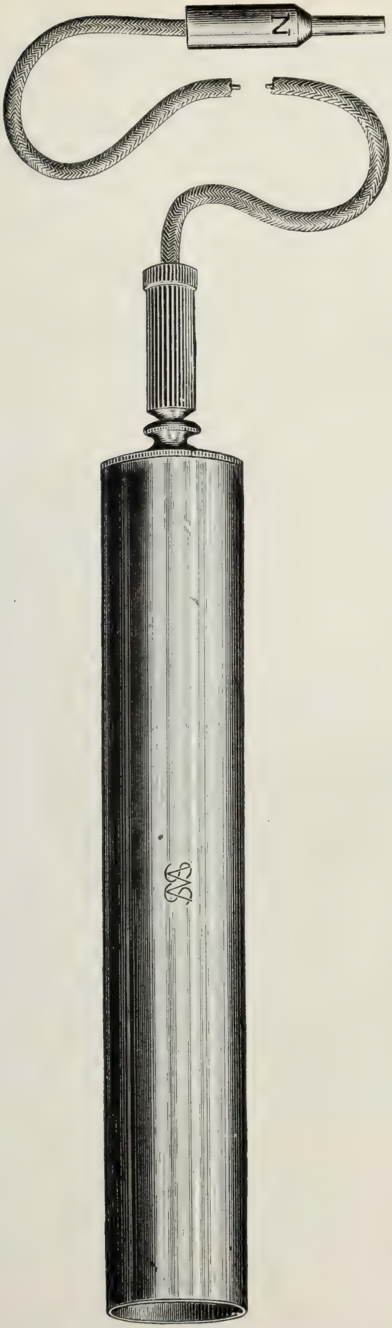
Fig. 4.



Weston milliampèremeter.

From the above explanation as related to the process of electro-sterilization, it is obvious that the correct measurement of the amount of current applied to a patient is of the utmost importance, as it is the safest means of guiding us during its application. Hence the importance of procuring a trustworthy milliampèremeter. The best instruments are those constructed after the Deprez-d'Arsonval deadbeat (non-trembling) type. The Weston milliampèremeter (Fig. 4) is a most reliable current gage. The face of the latter instrument, suitable for this work, should be calibrated into five milliampères, with subdivisions of a tenth to a twentieth of a milliampère. To convey the current to the patient, different colored flexible

FIG. 5.



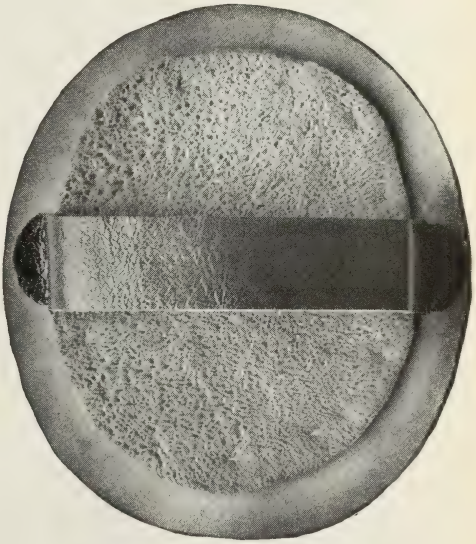
Metal negative hand electrode.

cords are employed which terminate in suitable electrodes. In connecting up the whole apparatus extreme care must be observed in joining equal poles to each other, viz, positive pole must be connected to positive pole, and *vice versa*. To locate the respective poles, the following simple experiment may be employed.

Experiment: Location of Poles.

Moisten a piece of blue litmus paper with sodium chlorid solution. Place the two poles of the battery about one inch apart on the wet paper and turn on the current. In a few moments a pink spot will develop where the *positive* pole touches the paper.

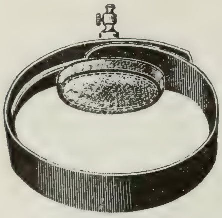
FIG. 6.



Sponge negative hand electrode.

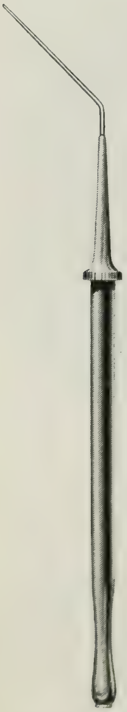
The two electrodes are terminals attached for the purpose of conveying the current to the patient, and consist of a negative electrode which is to be placed on the patient's skin surface, and a positive electrode to be introduced into the tooth. The negative electrode (Fig. 5) may be a piece of metallic tubing held firmly in the patient's hand, or a sponge electrode fastened to his wrist, or one of various modifications thereof. The size of the negative hand electrode is important; it should present at least five square inches surface area, which are to be brought into contact with the patient. A large surface of the negative electrode reduces the resistance, and consequently the tingling sensation or even blistering caused by the heat of a small electrode is avoided. The writer prefers the plain tube hand electrode, as it avoids the cumbersome wetting with salt water, loss of time in adjusting it, etc. It is immaterial in which hand the electrode is held. Rings, bracelets, wrist-watches, etc., must be removed, otherwise blistering of the patient's skin by mere contact may occur. To place the negative electrode upon the patient's cheek, lip, or gum surface by means of a clamp or spring, as recommended by some operators, is to be avoided, for the reason that severe burns may result. It has been stated that this blistering results from the formation of caustic sodium hydroxid near the negative pole. The blistering is the result of imperfect contact between the skin and the metal electrode, thereby increasing the resistance of a small area to such an extent as to produce high heat, *i.e.* an electric burn. The positive electrode to be introduced into the tooth consists of a piece of iridio-platinum wire No. 20 gage, about one inch long and tapered to a delicate point. The iridio-platinum alloy possesses the necessary flexibility, which is lacking in pure platinum. The point itself (Fig. 8) is ground blunt so as to avoid being caught when introduced into tortuous canals. Various sizes of

FIG. 7.



Sponge wrist electrode.

FIG. 8. FIG. 9.



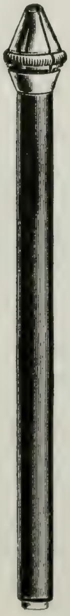
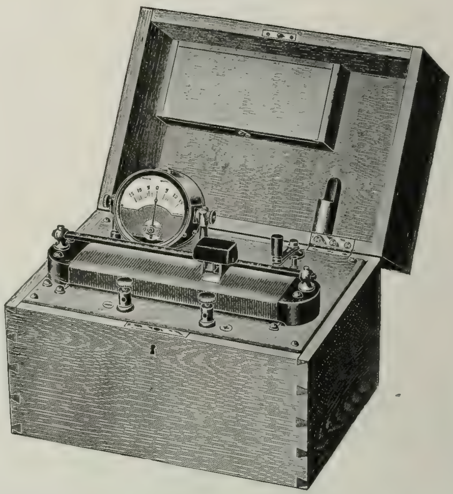


FIG. 8: Long-handle electrode with iridio-platinum point.

FIG. 9: Insulated electrode holder.

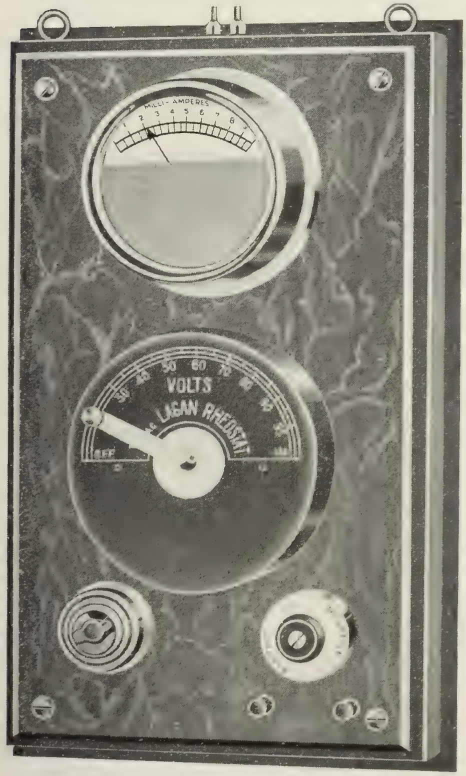
FIG. 10.



Galvanic battery for electro-sterilization.

these points may be kept on hand. No other metal should be employed for such purposes. To substitute the iridio-platinum point by zinc, copper, or any other metal, with the view of aiding its therapeutic effects, is not only useless but it markedly interferes with the action of electrolysis in the relatively small area of a root-canal, also the resultant ions may discolor the tooth. A long-handle electrode holder, insulated with hard rubber, is essential to suitably unite the electrode with the conducting cord. The holders may be of various types, so as to give ready access to all parts of the oral cavity. From the foregoing description of the source of the current, its control, and its mode of application, it may be observed that essentially it is a duplicate of the armamentarium applied in producing cataphoresis. Any apparatus, therefore, that is or has been used for inducing cataphoresis may be equally successfully employed for the electro-sterilization of root-canals.

Fig. 11.



Switchboard for electro-sterilization. (McIntosh.)

CHLORIN AS A DISINFECTANT.

Of all the known chemic disinfectants, chlorin, freshly prepared, and in the presence of moisture and a suitable temperature, possesses the greatest known germicidal power. Chlorin forms the active constituent of Labarraque's solution, Javelle water, antiformin, otherwise known as dental radicin, electrozone, or dental meditrina, and of the antiseptic solution so successfully employed at present in the English and French war hospitals according to Dakin's formula by the Carrel method, which latter preparation is now advertised abroad as eusol, and in our country in the form of a salt, as chlorazene. The great success obtained with Dakin's solution rests primarily upon the fact that a fresh preparation according to a specific (Carrel) method is employed, which, while acting deleteriously on the germs, does little harm to the tissue cells, as it is a non-irritating isotonic wound antiseptic. All of these solutions have sporadically come to prominence in the past. While the laboratory reports, as far as the germicidal power of these solutions is concerned, appear to be highly satisfactory, practical application does not bear out the enthusiasm. It should be borne in mind that most of these preparations are irritating, and that chlorin solutions are labile compounds. All of these enumerated solutions lose their activity within a week or two, hence the disappointing results when commercial stock preparations are employed.

The rationale of sterilizing an infected wound surface by the Carrel method is based on the following conception: "To render an infected wound sterile it is necessary to employ a suitable antiseptic in such a manner that the chosen antiseptic comes into contact with every portion of the wound, that the antiseptic is maintained in a suitable concentration throughout the entire wound, and that this constant strength is maintained for a prolonged period. If these conditions are fulfilled, every wound will show its response to the treatment by the diminution and disappearance of its micro-organisms." The ionization of a 1 per cent. sodium chlorid solution by means of the galvanic current within a root-canal furnishes free chlorin *in status nascendi* in the presence of moisture and body temperature which is most active, and admirably suited for our purposes. The free chlorin sterilizes the walls of the root-canal (see below) and bleaches the discolored dentin. Incidentally, the ionization of the salt water furnishes an appreciable amount of hydrochloric acid which acts as a superficial solvent of tooth structure, and thereby enlarges the root-canal. The two chemicals, according to Lehmann-Zierler, are present in the proportion of five parts chlorin to three parts hydrochloric acid. The small quantities of sodium compound which are formed within the vicinity of the negative pole are taken care of by the tissue fluids.

Experiment: Presence of Chlorin.

Place the two poles upon a piece of filter paper moistened with a solution of indigo blue in sodium chlorid solution. Within a few minutes the blue color will disappear, due to the reducing (bleaching) effect of the liberated chlorin. Notice the odor of chlorin.

Much importance has been attributed by some writers to the presence of ozone and nascent oxygen formed during the decomposition of sodium chlorid according to the equation: $H_2O + Cl_2 = 2HCl + O$. The presence of ozone could not be detected chemically. The small quantity of free oxygen may be considered a negligible factor as far as disinfectant action in this connection is concerned. Silver salt solutions, as has been definitely demonstrated by Bethel, or copper or mercury salt solutions, may be used for the purpose of sterilizing root-canals in connection with the electric current. While these solutions, if one depends upon their metallic ions, are proportionately weaker than the chlorin ion obtained from a sodium chlorid solution, incidentally they always discolor the tooth structure, and consequently offer no advantage. Zinc chlorid solution, which seems to be largely employed for such purposes, does not possess superior merits over the simple sodium chlorid solution; the active agent, free chlorin, obtained in both instances is the same. The ionized zinc of the zinc chlorid solution possesses no merits as an antiseptic agent.

For dental purposes, a 1 per cent. solution of sodium chlorid in water is best suited. Roughly speaking, a scant teaspoonful of salt dissolved in a pint of boiled water answers the purpose.

ELECTRO-STERILIZATION EQUATION.

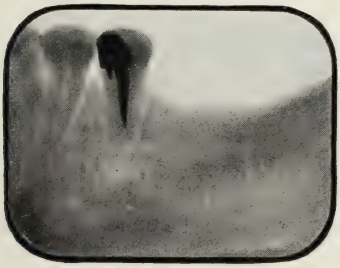
In the various communications treating on root sterilization by electrolysis the very important questions concerning the *time* during which the current is applied, the *number of milliampères* employed and *bacteriologic tests* of the resultant sterility are usually vaguely treated. To illustrate our contention we append the following extracts picked at random from recent publications on this subject:

> A perfect method of sterilizing root-canals is to be found in ionic medication. In a tortuous or constricted canal the application of two or three milliampères of current for five or six minutes is sufficient to produce ions from a compound solution of antiseptic salts which will penetrate the length of the canal and sterilize it effectively. (Sturridge.)
>
> A current of three milliampères for fifteen minutes, using zinc or iodin properly applied, will sterilize a root and surrounding tissue as no retained medication ordinarily accomplishes. (Frank Price.)
>
> A current of from two to three milliampères is then passed for fifteen minutes. (Forbes Webster.)
>
> The Edison 110-volt current passing through a rheostat furnishes the power by means of which the zinc is decomposed and nascent

chlorid of zinc forced through the end of the root, with the accompanying electric ions. This destroys the pathogenic tissue, and leaves an environment in which it is impossible for micro-organisms to exist. The electrolytic action is maintained for from three to fifteen minutes, depending on the extent of diseased tissue that is to be eradicated. The average strength of the current is about one milliampère. (M. L. Rhein, 1911.)

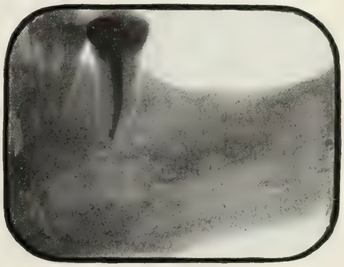
From a careful perusal of the above quotations it will be seen that the strength of the current and the time for its application as stated are empiric suggestions. No proof is furnished concerning the resultant bacteriologic action of the electrolytic process, and as a consequence the term *sterility* as used by the authors cited is employed in a purely arbitrary manner. The process of electro-sterilization, therefore, would merely add another method of empiric medication to the numberless procedures in existence unworthy of lengthy discussion, if it could not be definitely proved that it would furnish unquestionable evidence of obtaining the absolute sterility of an infected root-canal. Fortunately such proofs are available, and the establishing of this fact at once places this procedure far above any other known therapeutic measures employed for such purposes.

FIG. 12.



(Mrs. A. B.) Lower right second bicuspid. Root-canal is imperfectly filled. An area of disturbance is visible about the apical tissues. Continuous gnawing pain, increased on pressure (mastication). X-ray taken May 16, 1916.

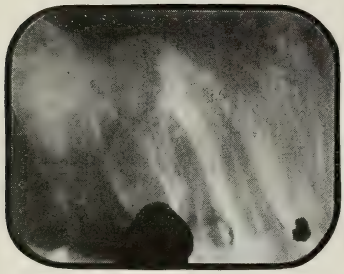
FIG. 13.



(Mrs. A. B.) Same tooth as in Fig. 12. Root-canal received three treatments by electro-sterilization; root-canal filled. Former trouble has completely subsided. X-ray taken Jan. 4, 1917. Again inspected Feb. 20, 1917; tooth in perfect condition.

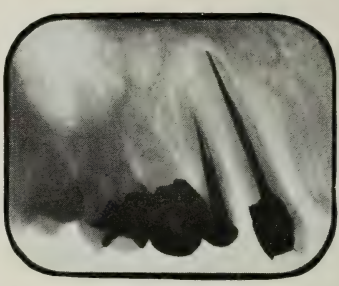
When we speak of sterility of a primarily infected root-canal in the present light of bacteriologic knowledge the truth of this assertion has to be proved by rigorous tests, otherwise the term sterility loses its significance. These tests are readily made by obtaining cultures at stated intervals from the canal under treatment until complete negative results of growth are obtained. Regarding the bacteriologic tests as applied to electro-sterilization, we proceeded as follows: Cultures of the infected root-canal were made before treatment was instituted, and then every five minutes thereafter for a given period of time, usually twenty minutes. The infected agar plates were incubated in the routine manner (see below). Incidentally, the time of applying the current, and also its strength, were carefully noted. By comparing the results obtained, a definite relationship between the strength of the current, the time of application, and the resultant sterility could be established. Zierler deserves credit for having first noted the inter-relationship of these factors, and he has suggested the use of a numerical constant which furnishes a working basis for its clinical application. This constant is 30. By multiplying the number of milliampères employed by the time in minutes used in the process of obtaining a sterile root-canal, invariably a number was obtained which closely hovered about the figure 30; or, reversely, by dividing the constant 30 by the number of milliampères employed a quotient is obtained which gives the time in minutes during which the current must be applied. Apparently, a given infected surface area requires for its sterilization a specific amount of migrating ions; at least we are able to verify this assertion as far as the germicidal action of ionized chlorin is concerned in the sterilization of infected root-canals. Hence the numerical constant 30 may be looked upon as expressing in units the surface area of an average root-canal. In our experimental work and in clinical practice we have based our observations upon the above principle, and have collected sufficient data as proofs that the appended electro-sterilization equation, as we have termed this formula, is a reliable guide for the application of these procedures in the treatment of infected root-canals: $\frac{30}{\text{M.A.}} = \text{T}$, the 30 representing the numerical constant, M.A. the number of milliampères, and T the time in minutes.

Fig. 14.



(Mrs. S. W.) Upper left first bicuspid. Chronic pericementitis with abscessed area about the foramen; root-canal filled with pus. Continuous pain for over a week. X-ray taken July 10, 1916.

Fig. 15.



(Mrs. S. W.) Same tooth as in Fig. 14. Root-canal received three treatments by electro-sterilization. Root-canal filled. X-ray taken January 12, 1917. On inspection no further trouble found.

Table A.—Electro-sterilization of Teeth in the Mouths of Patients.

Patient.	Milliampères.	Electrolyte.	5 min.	10 min.	15 min.	Constant.
No. 1	0.5	1% sod. chl. solution	+	+	+	0
" 2	2.5	"	+	+	0	37½
" 3	3.0	"	+	0	0	30
" 4	3.5	"	+	0	0	35
" 5	1.5	"	+	+	+	0

Growth +. No growth 0. The inoculated agar plates are incubated for 24 hours at 40° C.

The accompanying tables (A, B, C) selected from experimental records, will substantiate our claims.

If we add the three constants which show sterility = 102½ and divide the total by the number of patients, we arrive at an average constant, 34, which in round figures may be reduced to 30. Various attempts were made to materially lower this constant, but so far (as regards sodium chlorid solution) these attempts have not been successful.

Table B.—Electro-sterilization of Extracted Teeth having Gangrenous Root-canals.

Teeth.	Milliampères.	Electrolyte.	5 min.	10 min.	15 min.	25 min.	Constant.
No. 1	0.5	1% sod. chl. solution	+	+	+	+	0
" 2	1	"	+	+	+	0	25
" 3	2	"	+	+	0	0	30
" 4	3	"	+	0	0	0	30
" 5	5	"	0	0	0	0	25

Growth +. No growth 0. The inoculated agar plates are incubated for 24 hours at 40° C.
Total constants: 110 : 4 = 27½ average constant.

Table C.—Electro-sterilization of Plated Mixed Cultures Obtained from Gangrenous Root-canals in Agar.

Plate.	Milliampères.	Electrolyte.	5 min.	10 min.	15 min.	Constant.
No. 1	1	1% sod. chl. solution	+	+	+	0
" 2	2	"	+	+	0	30
" 3	3	"	+	0	0	30
" 4	4	"	+	0	0	40

Growth +. No growth 0. The inoculated agar plates contain 1% sodium chlorid and are incubated for 24 hours at 40° C.
Total constants: 100 : 3 = 33⅓ average constant.

The above experimental work furnishes sufficient proof, and this fact is borne out in clinical practice, that sterility of the walls of an infected root-canal may be obtained by electro-sterilization. It should be borne in mind, however, that this particular type of sterilization means *sterility of the walls of the root-canals only* and *not* of the entire tooth root. To prove the correctness of this statement, which on its very face is self-evident, tooth roots Nos. 2, 3, and 4 of the experiments recorded in table C were cut into coarse shavings, plated on agar, and placed in the incubator. In 24 hours all three plates showed luxuriant growth. We emphasize again what we have stated in the past at frequent intervals: Complete sterilization of an infected tooth root *in situ* is impossible by any of the present known methods; complete sterilization of the surface of an infected root-canal is possible by electro-sterilization as outlined above.

CLINICAL APPLICATION OF ELECTRO-STERILIZATION.

To convey to the reader a practical working knowledge of the clinical application of the principles of electro-sterilization, it is probably best to describe the actual *modus operandi* in detail as employed in a typical case. The patient being seated in the chair is covered by a rubber apron sufficiently large to reach over the chair arms, so as to protect him from accidental shock by "grounding" the current. The root-canal of the tooth to be treated must be mechanically cleansed of its débris, and if necessary enlarged so as to give free access to the wire electrode. Before starting the ionizing process it is best to assure oneself of the correct working of the current by bringing the two poles together for a moment; the moving of the needle of the milliampèremeter in the right direction acts as an indicator that the apparatus is in working order. The rubber dam having been adjusted, the root-canal is now flooded with a 1 per cent. saline solution—an S. S. W. minim syringe No. 29 is useful for this. The patient takes a firm hold of the negative electrode with his hand, which must not carry rings, bracelets, etc. Before introducing the freshly flamed positive pole into the canal the operator should see for himself that the knife switch is open, and that the controller is set at zero. If the wire electrode fits the canal too loosely, a few fibers of cotton moistened with salt water are wrapped about it. The needle is introduced as near to the apex as possible, and the knife switch is closed. The controller is now very slowly turned on, and the patient is told to at once raise his hand when he feels the slightest sensation. The moving needle of the milliampèremeter will indicate to the operator that the current is flowing in the right direction. When the patient raises his hand the controller is turned very slightly back, left at this point for about half a minute, and again very slowly turned forward until the patient again responds, or until the point of tolerance is established. This point the writer has termed the "irritation point." A glance at the milliampèremeter conveys to the operator the number of milliampères employed. The operator now recalls to his mind the numerical constant 30, and quickly calculates the time of his particular case of electro-sterilization by dividing 30 by the number of milliampères employed. The resultant quotient gives the time in minutes for which the current must be applied. Example: If patient's irritation point is 2.5 M.A., 12 minutes by the watch are required for the sterilization of this particular root-canal. If the resultant quotient is a fraction, the writer recommends that the next higher unit be substituted as the indicator of the time. Each root-canal of a multi-rooted tooth is preferably treated separately. If a clamp electrode holder is employed to clasp the two or three wires inserted into the multi-rooted tooth care should be exercised to prevent short-circuiting. To avoid polarization of the positive electrode, *i.e.* covering by a film of nascent gases which materially interferes with the flow of the current, the needle should be removed at five-minute intervals (turn off current previously!) and wiped off. During the process of electro-sterilization a drop of salt water should be added every few minutes to make up for loss by evaporation. Care must be exercised to prevent short-circuiting of the current by allowing salt water to seep under the rubber dam and thus transfer the current to the gum tissue. After finishing the operation the controller is slowly turned to zero, the knife switch is opened, and the electrode removed from the tooth. Never remove the electrode without having first cut off the current, otherwise the patient receives a disagreeable shock or a flash of light passing in the eyes. On passing a few fibers of cotton or a paper cone into the root-canal, a pronounced odor of chlorin should be perceptible. A wisp of cotton or a cone wet with salt water is placed in the root-canal, and the latter is closed with gutta-percha stopping. The treatment is to be repeated within 48 hours, and if necessary again on the fifth day, and the canal is immediately filled after the last treatment. A root-canal should never be filled immediately after the initial treatment; an interval of at least 24 hours should be allowed before doing so.

Migrating ions do not develop their maximum degree of therapeutic efficiency within the short period of time during which the current is applied. It requires practically 24 hours to produce their full activity within the region of a root-canal and its surroundings. The clinical indications of complete sterility are definite odor of chlorin and a clean paper or cotton cone after 48 hours' insertion. In doubtful cases sterility should be verified by a bacteriologic test.

If a metal filling is present in the tooth under treatment, it should be removed, because if touched by the electrode after the current is turned on it may be short-circuited through the filling, and the patient will receive a shock. Moreover, the action of the chlorin ions upon the metals of the filling materials results in the formation of metallic chlorids, which infiltrate the dentin structure, producing discoloration. This is particularly true in the case of gold chlorid thus formed, which by secondary decomposition stains the tooth structure a deep purple tint.

When the products of pulp decomposition pass beyond the foramen of a tooth, localized pathologic disturbances of the pericementum arise, which usually lead to the formation of an abscess. Without entering into the further discussion of the pathology of the disturbances at this moment, let us assume that the disturbances are eradicated by establishing drainage along the lines of least resistance. If the drainage takes place through the root-canal we speak of this condition, although wrongly, as a blind abscess, while if the drainage occurs through an artificially established canal through the bone and gum tissue a fistula results. Acute types of the enumerated disturbances yield readily to electro-sterilization, provided the salt solution and the positive electrode reach the seat of the infection. For the treatment of an abscess draining through the root-canal the positive electrode is thrust through the foramen into the abscess cavity; the treatment of an abscess with a fistula requires a somewhat modified application. In the latter case complete communication between the root-canal and the mouth of the fistula must be first established by forcing warm salt water through the canal. The root-canal is now treated as outlined above; the fistula itself requires a separate application of the procedure. The positive electrode is passed into the fistula, entering at its outlet and carried along the fistulous tract until the root is felt, while the negative pole, consisting of a piece of copper wire surrounded by salt water, is placed in the root-canal. The sterilization equation for this treatment is the same as already outlined. Usually the patient requires a lower milliamperage for such work. All types of chronic abscesses will yield to this method of treatment, provided the necrotic area involved is very small, and that the seat of disturbance is reached by the electrode and the salt water. Well-defined granulomata, complicated by large areas of necrosis are *not* benefited by electro-sterilization; they require surgical interference as the last resort. Root amputation is indicated for such purposes, and if carried out according to special technical methods, usually produces most satisfactory results.

SUMMARY.

(1) The surface of an infected root-canal of a tooth may be completely sterilized to the depth of a few millimeters by a weak direct current in the presence of a 1 per cent. sodium chlorid solution. The current must be of medium voltage, *i.e.* about 30 to 40 volts, and a low ampèrage, *i.e.* from 0 to 5 milliampères.

(2) A weak electric current *per se* produces no measurable bactericidal action.

(3) The most suitable (electrolytic) solution for the electro-sterilization of infected root-canals is a 1 per cent. sodium chlorid solution. Its ionization produces free chlorin, and to a less extent hydrochloric acid.

(4) In the light of our present knowledge it appears that a 1 per cent. sodium chlorid solution is superior for this purpose to any other metallic salt solution.

(5) In practice, the degree of concen-

tration of the solution to be ionized has no effect on the quantity of ions produced. The latter depends primarily on the strength of the current multiplied by the time for which it is applied. Ionization is transformed electric energy.

(6) A sufficiently accurate electrosterilization equation for sterilizing infected root-canals applicable in clinical practice reads as follows: $\frac{30}{\text{M.A.}} = \text{T}$. The experimentally found numerical constant, 30, is divided by the number of milliampères, M.A., applied. The resultant quotient gives the time, T, in minutes for which the current is to be applied.

(7) The positive electrode to be placed in the root-canal should be a suitably shaped iridio-platinum wire; the negative hand electrode should have at least 5 square inches surface area.

(8) Silver and copper (and mercury) as ions are the only metals which possess (and that only to a limited degree) a germicidal action; their ions discolor tooth structure. A zinc electrode is not ionized by an electric current in the presence of a 1 per cent. sodium chlorid solution at the low ampèrage employed in the sterilization of root-canals. If a zinc chlorid solution is substituted for the sodium chlorid solution, zinc ions are produced, but these ions are devoid of supposed germicidal properties.

40TH AND SPRUCE STS.

Operative Treatment of Prognathism.

By THOMAS G. ALLER, D.D.S., M.D., Philadelphia, Pa.

(Read before the Academy of Stomatology of Philadelphia, November 28, 1916.)

PROTRUSION of the lower jaw, when extensive, is one of the most repulsive and conspicuous deformities of the face; and even though the patient be brilliant, pleasant, and peaceful, he will always be judged, from his appearance, as sordid, morose, and vicious. For this reason, when the condition does occur—and happily it is rare in Caucasian races, although common among savages—it should receive attention as early as possible.

The etiology of prognathism is somewhat obscure. Brophy attributes it to inattention to the teeth during the period of eruption. The upper incisors are permitted to erupt posterior to the lower, thus allowing farther and farther protrusion of the mandible, and at the same time the overlocking of the upper teeth is lost. Blair considers that a sliding forward of the body of the mandible as a whole and the enlargement of the tongue are usually the causes. It may be atavism. We believe that relaxation of the tendons and ligaments of the temporo-mandibular articulation is the best explanation as to the primary cause.

Protrusion of the mandible may be apparent or real. If there be lack of development in the antero-posterior diameter of the maxillæ, though the mandible be normal it may appear to be elongated.

The diagnosis of real protrusion of the mandible is simple. The lower first molar usually occludes with the first upper bicuspid on either side, and in extensive protrusion the chin may be advanced so that the cuspids occlude with the first molars. This gives the characteristic "bulldog" jaw appearance. Defective enunciation is present because it is impossible for the tongue and lips to properly functionate. There may also be excessive protrusion of the lip, enlargement of the tongue and adenoid tissue of the oral pharynx, and more or less opening of the bite.

Viewed from a clinical standpoint, we feel that there are three classes into which all cases of mandibular protrusion may be divided, namely:

(1) *Orthodontic.* Cases in the young, under thirteen years, when the body of the jaw has not elongated sufficiently to produce marked deformity, and the subjects are in good physical condition.

(2) *Operative.* Cases of any age, in good health, with marked protrusion, especially when the bone is hard and dense. These are the cases referred to by Dr. Angle when he says, "Any orthodontic procedure is powerless to render improvement, and the double resection is the only resort."

(3) *Non-operative* or prosthetic: Cases with marked deformity, in poor health, with bad teeth or edentulous and neglectful.

We shall consider only class 2, or operative cases, in the present paper.

METHODS EMPLOYED BY VARIOUS SURGEONS.

The pioneer in this field of surgery was Dr. S. P. Hullihen of Wheeling, W. Va., who successfully devised and performed a partial osteoplastic resection of the jaw in 1850. Drs. Angle and Ottolengui discussed the operation in 1903. Talbot, 1907, reports a case in New Orleans that was not successful, the entire lower jaw being lost by necrosis.

However, Dr. V. P. Blair, in 1906, was the first to devise an operation for shortening the mandible, correcting the protrusion, and establishing normal occlusion of the teeth. He says, "Where the lower jaw, as a whole, occupies a forward position there will be lateral protrusion, for two reasons: (1) The broader posterior part of the lower jaw is brought opposite the anterior portion of the upper; and (2) when this occurs, the impact of the jaw is taken not on the buccal cusps of the lower molars, as is normal, but on a point nearer the lingual cusps. This tends to rotate the lower molars lingually, which is accompanied by an outward rotation of the lower border of the bone. Thus we have a real spreading of the bone at the lower part of the body." This lateral protrusion must also be corrected.

Fig. 1.

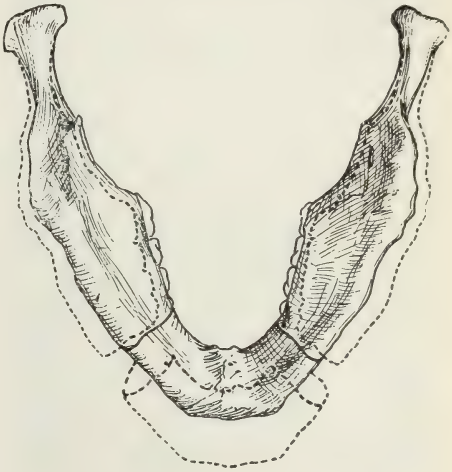
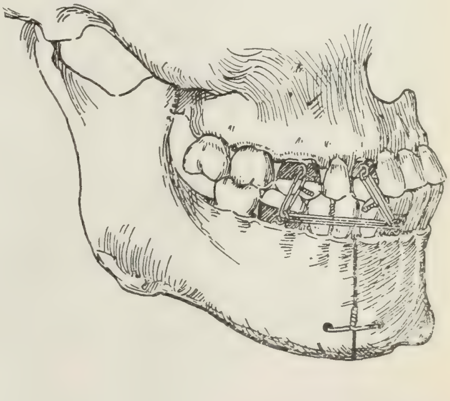


Fig. 2.



Sections of the bone of the proper size are removed (Fig. 1), and the remaining portions are brought together; then the sections shown in the dotted lines are moved in and back to form the new arch. The lateral sections rotate on an axis corresponding not to the last molar tooth, but to the temporo-mandibular articulation. If the submucous operation is done, preferably the lower second bicuspids should be extracted one month before the operation.

FIG. 3.

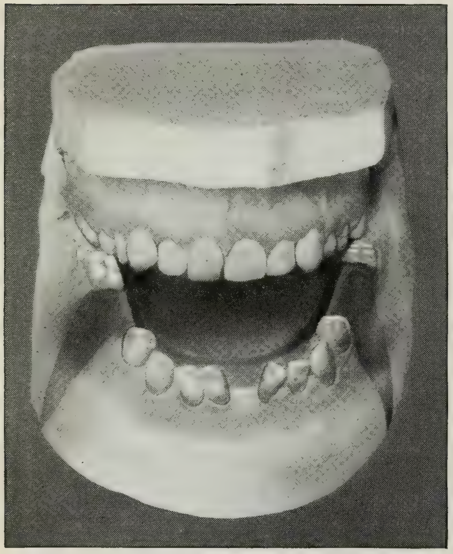
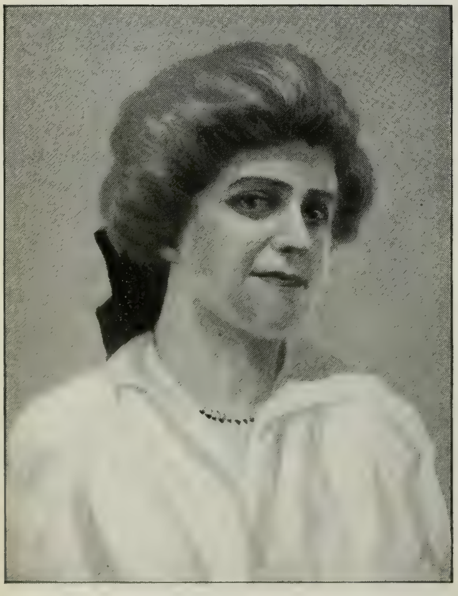
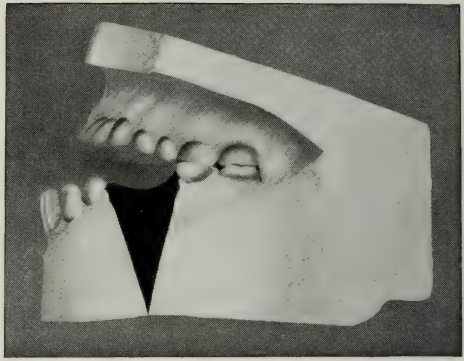


FIG. 4.



Blair cuts out the sections with a saw, wires the bone, and having previously placed bands on the teeth, wires the upper to the lower at the same time that he twists the silver wire in the bone. (Fig. 2.)

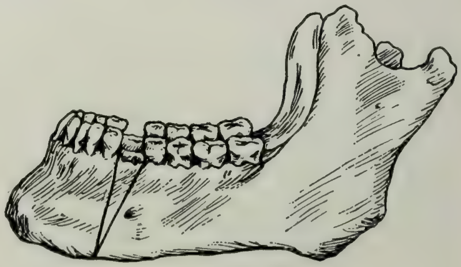
FIG. 5.



Harsha of Chicago did a double submucous resection of the body of the mandible just back of the second molar.

Dr. W. W. Babcock, 1909–10, has had several cases, and favors the transverse division of the rami, either intra-orally or by external incision, pushing the chin upward and backward, thus leaving a V-shaped opening between the segments of the rami, in which he places magnesium or ivory spools.

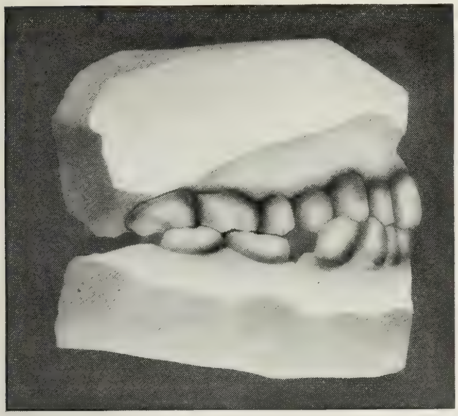
FIG. 6.



Dr. Cryer recommends making a semicircular cut through the angle of the jaw to the anterior border of the ascending ramus on each side. The convexity of the cut is downward and forward, thus allowing the body of the jaw to slide back and the teeth to occlude.

Sir Arbuthnot Lane divides the body of the ramus transversely just above the level of the inferior dental foramen, allowing the body of the jaw to slide back; he then fastens the fragments of the rami in this position with plates. Dr. Harsha of Chicago makes an incision just below and in front of the angle, chisels out a section of bone, preserving the inferior dental nerve, and then wires the fragments together.

FIG. 7.



The case we are presenting for your consideration this evening was one kindly referred to us by Dr. D. M. Hitch of this city. She was a robust girl eighteen years of age, family history negative, showing an enlargement of the lower lip, with a crease below the lip, marked protrusion of the lower jaw, and open bite, only the second molar occluding on one side and the first and second molars on the other side. (Fig. 4.) Radiographs showed unerupted lower third molars. The flow of saliva was considerably increased, the tongue was enlarged, and the two lower central incisors were fan-shaped and inclined distally. She lisped, and was extremely sensitive to her condition. Her mouth was almost constantly open.

Impressions were taken and casts made. (Fig 3.) The cast of the lower jaw was cut, taking out a triangular section on each side including the second bicuspids, the base of the triangle being at the occlusal surface of the second bicuspid. (Fig. 5.) The segments were waxed together, and German-silver splints made in the usual way. These splints had small hooks soldered on their buccal surfaces at intervals. Two days were allowed in which to take the impressions, make the splints, and bring the mouth to an aseptic condition.

FIG. 8.

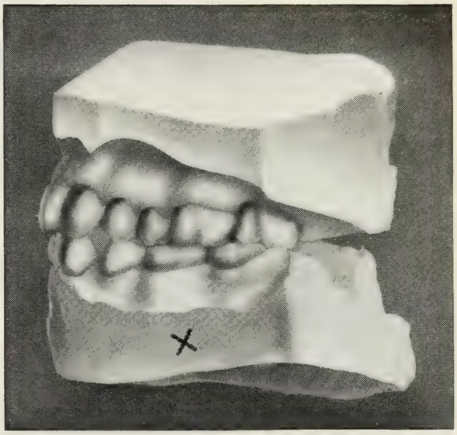
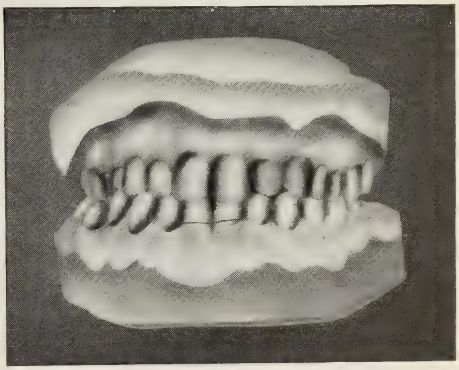


FIG. 9.



On the third day the patient was etherized, and the lower second bicuspids on each side were extracted. The desired V-shaped sectors in the bicuspid region were mapped out with a knife on the gum. Having the mouth open and the lower border of the lower jaw resting on a specially padded block, triangular sections of the bone were cut out intra-orally with a chisel and mallet. (Fig. 6.) The wound was swabbed out, carefully irrigated and bleeding controlled, great care being taken not to cut through the skin. The parts were approximated, the wounds painted with Friar's balsam, and the splints were adjusted but not cemented. A Barton bandage was applied. The next day the mouth was cleansed with an antiseptic solution, the parts dried, and the splints cemented in place. They remained in position for one day, when the mouth was again cleansed and dried, and the splints re-cemented in place. After one day the splints again worked loose, but our difficulty, we felt, lay in not being able to get the mouth thoroughly dry because of the large amount of saliva always present. Therefore, after failing a third time to make the splints hold, we wired the upper teeth to the lower, not using the teeth adjacent to the incisions, doubling the brass wire around the necks of the teeth, and then diagonally joining these wires to the lower teeth wires. The patient made an uneventful recovery with no infection whatever, and left the hospital after a two weeks' stay for her home in Maryland.

FIG. 10.

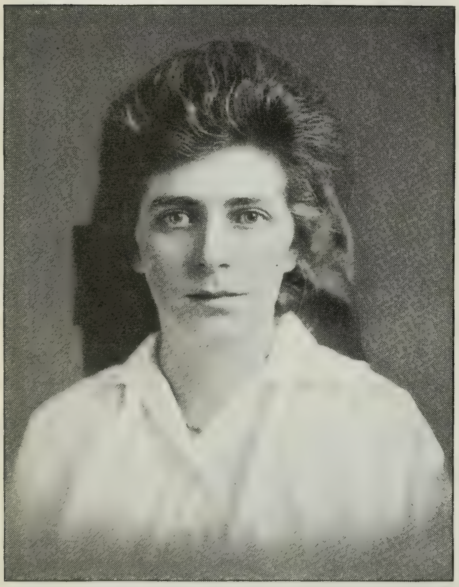
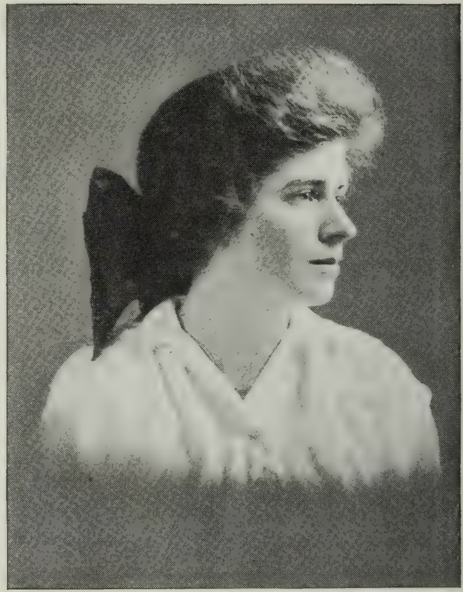


FIG. 11.



She returned at intervals for inspection, and after eight weeks all wires were taken off. Slight callus formation was present on palpation; union was perfect; the line below the lip had disappeared; the lip was smaller, as was also the tongue, and articulation was good. (Figs. 7 and 8.)

We then referred the case back to Dr. Hitch, who, by means of orthodontic appliances successfully brought to their normal positions the lower centrals as shown in Fig. 9, and has strengthened them by banding them to a lingual bar. At the time of making the last photos (Figs. 10 and 11) the patient could talk perfectly, the lip and tongue had retracted to normal, and the callus at the lower border of the mandible was hardly palpable.

CONCLUSION.

At the time of our operation we could find no surgical work with any reference to this subject, although we now find the operative procedure described in two recent oral surgeries. From the literature it would seem that there are several varieties of operations that have proved fairly satisfactory for correcting protrusion of the mandible, namely, various resections of the body of the mandible or transverse sections of the rami. We agree with Blair that if there is overgrowth of the body of the mandible, it is advisable to resect the body of bone. If there is a sliding forward caused by elongation of the rami, transverse incisions in the rami (the Babcock operation) are advisable. We consider the banding of several teeth on each side the best fixation for occlusion. Bands with rings on the buccal side may be cemented on individual teeth, bands with bolts and nuts may be used, or bands connected with rods and nuts. Forces acting in two directions are required for the purpose of drawing up both sections, and also for drawing the excised ends together. The teeth adjacent to the cut should not be banded. A competent dentist, preferably an orthodontist, should be associated with all such cases, as the upper jaw may need to be widened before the operation on the mandible is undertaken. Likewise the services of the orthodontist may be needed for some time after the operation.

SUMMARY.

We believe our operation has the following advantages:

(1) It leaves no scar.

(2) In cases where the body of the mandible is elongated (the usual condition) it corrects that deformity in the logical way, namely, by shortening the body of the mandible.

(3) Anterior occlusion can be obtained, as taking out V-shaped wedges throws the chin up and in, and the lower teeth are held in by the upper anterior teeth, with no tendency for the deformity to recur.

(4) The periosteum is not lifted from the bone.

(5) It gives the best approximation of sections and immobilization of parts, because the two cut ends meet squarely.

I wish to thank Dr. D. M. Hitch for his excellent assistance and advice, Dr. J. R. Cameron for assistance at the operation, and Dr. E. C. Kirk for kindly affording me access to the DENTAL COSMOS library.

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1126 SPRUCE ST.

Nitrous Oxid-Oxygen Analgesia and Anesthesia.

By H. A. TUCKEY, D.D.S., San Francisco, Cal.

(Read before the San Francisco District Dental Society, November 1916.)

BEFORE proceeding with the consideration of our subject proper, we will review briefly the current literature upon the subject. Probably the most important paper for our present consideration is the report of the Correspondent of the Dental Society of the State of New York, May 14, 1914,* purporting to determine whether or not nitrous oxid and oxygen was being used in operative dentistry with success.

The inconsistency and prejudice with which this report was fraught and its failure to satisfactorily bring about a scientific discussion of the merits and demerits of analgesia and anesthesia has prompted me, later in this paper, to present some facts based upon clinical practice.

The report ostensibly was concerned with analgesia and not anesthesia. Dr. Prentiss has used as the basis of his argument against analgesia Karl Connell's statement that "Nitrous oxid and oxygen in unskilled hands is more dangerous than ether or chloroform," and the statement of Dr. Henry Gillett that "We are minimizing a recognized surgical principle by assuming responsibility for the anesthetic and operation," which arguments are perfectly valid with regard to surgical anesthesia, but when applied to analgesia only bring about unwarranted prejudice against a method the success of which I will prove by clinical findings and not by personal opinions.

Dr. C. N. Johnson† speaks of the impracticability of the method, the possible detrimental effects upon the patient, the danger of approaching too close to the dental pulp in cavity preparation—which statement he supports by two cases—and lastly the demoralizing effect upon the stamina of the patient, all of which are absolutely without any scientific foundation.

Riethmüller, in his paper on anoci-association,* answers these unscientific criticisms as follows:

"Thus we have today the anomalous situation that, though dentistry has discovered and perfected to a high degree the discipline of nitrous oxid anesthesia, many of its disciples after a perfunctory trial have abandoned its practice, and without anything like just grounds have condemned it wholesale, while their condemnations in reality are nothing more nor less than a confession of inefficiency and lack of close application."

Dr. Gillett is wrong when he intimates that the surgeon is never responsible for both anesthetic and operation. Not ten per cent. of the surgery done today has as a supplement an expert anesthetist. The surgeon who employs an unqualified individual to administer an anesthetic makes himself responsible for operation and anesthetic, and endangers the success of both. Legislation is even now being enacted against certain nurse anesthetists. The properly trained specialist in anesthesia will forestall this danger, and this field is fast being supplied by members of our own profession. The greatest specialist on nitrous oxid and oxygen anesthesia today and the one who has given us the most scientific technique and development is no other than our own Dr. Chas. K. Teter.

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* DENTAL COSMOS for February 1915, p. 156.

† *Ibid*, October, p. 1102.

* *Ibid*, July, p. 743.

Therefore let it not be said that men of our own profession block the path of progress of anesthesia or analgesia. Such inadequate findings as the report of the Correspondent of the Dental Society of the State of New York are as much in order as were the efforts of J. Foster Brewster Flagg and his disciples, who in 1858 organized the Boston dentists against Morton in a formal protest against anesthesia in the public press.

Analgesia throws an entirely new light upon the dental operatory. It awakens in the mind of the operator a quick perception of the nervous and idiosyncratic tendencies of patients. They are tranquil and relaxed, in vivid contrast to the tenseness of the "sitting on edge" and "pulling on chair arms," which symptoms of expectant shock are spoken of by some of our colleagues as stamina.

Anyone versed in Crile and Lower's kinetic theory of shock will recognize the fallacy of expecting patients to remain quiet through painful dental operations or any other painful procedures. From this workable hypothesis we know that there is both muscular and nervous response to all traumatic shock produced by painful afferent stimuli. Dental pain which causes muscular effort to overcome is just as necessary to be relieved as any other surgical pain. Therefore the question which naturally arises is whether more ill effects are produced by shock in the presence of absolute consciousness, coupled with psychic fear and apprehension, together with the end result of work improperly completed on account of pain, or by any effect produced by nitrous oxid and oxygen, introduced as they are through the circulatory system.

It is not my purpose to indiscriminately recommend analgesia to every practitioner of dentistry, since it is a technique that must be worked out by each individual. Failures, and there will be many, must be cheerfully met and overcome. There are those who would not want to take the necessary time and care to develop this technique, and these should therefore desist from lending their aid to unwarranted criticism. It is becoming more necessary that pain be removed from our operations, and progress along anesthetic lines conducted carefully is productive of results interesting to the profession at large.

ANALGESIA.

Before inducing analgesia the patient should be seated comfortably, with tight neck-bands and clothing loosened. If possible the ten or eleven o'clock hour is best; analgesia is never advisable immediately after meals. The inhaler should be adjusted with dispatch by both operator and nurse. Warmed nitrous oxid should be started at 25 gallons per hour, the air-valve on the inhaler being open. Oxygen is given at the rate of 12 gallons per hour to the elderly and anemic, also to those showing any symptoms of cyanosis about the lips. Others do not require oxygen if the air-valve is open.

In about one minute the operator should tell the patient to watch for a slight tingling in the extremities. This knowledge is comforting at this induction stage, since it gives the patient a feeling of security, and creates confidence that the operator is well acquainted with the symptoms he is inducing. Incidentally this is the signal for operating. The symptoms of analgesia are better acquired empirically. However, harshness of voice—guttural phonation—fixed eyes, usually upon some object, are among the first symptoms. Other tests require disturbance of the patient, as direction tests, pricking the skin, pinching the ears. To continue a smooth, uninterrupted analgesia there must be no unnecessary conversation with the patient. Occasional suggestion and assurance only should be permitted. Quiet should prevail. The chair cuspidor should not be used, but a kidney basin substituted instead. It will frequently be necessary to caution the patient to breathe through the nose, as nasal and mouth breathing sometimes become confused.

The question is often asked, How do you prevent the patient from passing into the anesthesia stage? In a properly administered analgesia with a graduated apparatus true anesthesia is never induced. I believe that certain misunderstood symptoms are responsible for this question. For example, disturbed consciousness and inability of the patient to co-ordinate naturally are not symptomatic of anesthesia. A command to open the eyes, at the same time pressing vigorously upon the shoulders, unfailingly brings the patient to consciousness. Personally I prefer the eyes closed; better analgesia is obtained, and with definite controls on perfected apparatus the patient's condition and the depth of analgesia are always known. Profound relaxation, quiet, and efforts to complete the operation as soon as possible are points well to remember. Judgment is what we should all possess in this work, and will do much for the operator in determining the length of time to keep a patient under the anesthetic. The average "painful operating time" for ordinary cavity preparation and pulp exposure is from ten to fifteen minutes. There are many cases requiring little or no anesthetic for most of the work, and then sensitive areas may be encountered, when analgesia can be quickly induced, and should be used. The personal equation of every dentist naturally has much to do with where and when to use analgesia, and therefore it is not within the limits of this paper to describe every place where it is indicated. It should be remembered that analgesia is quickly induced, ready instantly, and exceedingly flexible in its application.

ANESTHESIA.

Short office anesthesia is so often required that a description of the technique seems in order. The same preliminary preparation obtains for anesthesia as for analgesia. Nitrous oxid is started at 150 gallons per hour, and oxygen at 15 gallons per hour. A mouth-prop, preferably of the De Pass rubber type, is inserted. If the rubber dam is in place no other rubber covering is necessary for the mouth. If not, a section of rubber ball is used to exclude all atmospheric air. If I make no other point clear than the absolute necessity for exclusion of air when inducing anesthesia, the purpose of this paper will have been served.

Almost every movement or disturbance in an anesthetized patient is due to the leakage of air either around the inhaler or the mouth. This may bring on clonic spasm, struggling, shaking the head, outcries, groaning, and laughter. Probably nitrous oxid received the name of laughing-gas from improper technique! No surgery should be attempted until the upper eyelid loses its tension—lid reflex—which will be in about one and one-half to two minutes. To commence operating before a patient is completely anesthetized is a most horrifying mistake. Uncontrollable patients should be allowed to recover from the effects of the anesthetic. I believe it unwise to struggle with a patient who would better be given a preliminary narcotic to insure success.

ANOCI-ASSOCIATION.

Nitrous oxid and oxygen and conductive anesthesia combined in oral surgery is probably just as beneficial as it has proved in general surgery. With our present perfected technique the use of ether can be very largely dispensed with, except probably in certain difficult lower third molar extractions. I do not believe it possible to exercise good judgment in anesthesia unless the operator is familiar with both conductive anesthesia and general narcosis with nitrous oxid. Let us consider some cases in point: Extensive infections due to alveolar abscess, upper or lower jaw, indicate nitrous oxid anesthesia. Extraction of whole teeth, nitrous oxid anesthesia, conductive anesthesia, or both. Badly broken down teeth and simple impactions are better managed under conductive anesthesia and nitrous oxid analgesia, because more time can be taken, and less destruction of tissue and process results. Root amputations are absolutely in the conductive anesthesia class, supplemented with nitrous oxid analgesia when indicated. Here time and hemostasis are of utmost importance, and in no other way better secured. The anesthetic of choice is the one that will accomplish the result with the least post-operative discomfort to the patient.

In all methods of anesthesia we have seen at some time certain untoward symptoms, such as tremor, cold sweating, rapid pulse and respiration, and even syncope occur before or just at the beginning of the anesthesia. We cannot account for this in any other way than as the result of psychic shock. This condition I have met with more with conductive than with nitrous oxid anesthesia. Therefore I have for the last year supplemented all injections of novocain with nitrous oxid analgesia. In most cases I have found it of great value to keep the patient in the analgesic state throughout the operation. Another point I believe to be important is not to discuss the anesthetic with the patient. Analgesia is induced and the patient is conscious of the surroundings. In other words, he knows he is not asleep!

Injections for conductive anesthesia are now made, unknown to the patient. The psychic dread of the needle insertion and the vaso-motor disturbance of suprarenin are not noticed or appreciated. We now have the patient tranquil; there has been no psychic shock, and we have successfully produced anoci-association. The operation is now proceeded with. Occasional remarks of assurance are very comforting. There is no pain, and the patient knows he has been conscious throughout. One must operate under these conditions to appreciate the end result.

In the foregoing I desired to make clear the fact that every patient presents a different physical make-up, and it behooves the dental surgeon to make a choice of the anesthetic for the operation in hand just as a general surgeon must do, that is, as the case indicates. Such men as Riethmüller and Stern, while strong advocates of conductive anesthesia, recognize its greater possibilities when combined with nitrous oxid analgesia.

Preliminary sedatives should be used more often as a preventive of psychic disturbances where considerable work is to be undertaken in the office. Bromural, 5 grains one hour before and 5 grains one-half hour before operating is usually sufficient; however, 5 grains more may be given when indicated.

In hospital work when nitrous oxid and oxygen is the anesthetic to be used, one-sixth of a grain of morphin followed by one two-hundredth of a grain of scopolamin is a good routine.

Many surgical procedures may therefore be done in the office surgery, when for economic reasons the hospital becomes prohibitive. The combination of nitrous oxid analgesia, taking the place of strong narcotics, and nerve-blocking makes it possible to do extensive extractions and root amputations comfortably and painlessly. I believe it unnecessary, with our present perfected technique in conductive anesthesia, where it can be employed, to etherize a patient for dental surgery, except for lower third molar impactions.

EFFECTS OF NITROUS OXID AND OXYGEN ON THE BLOOD AND TISSUES OF THE BODY.

To answer the question propounded earlier in this paper, viz, whether more injury is produced by mental shock, fear, and apprehension, or by any effect produced by nitrous oxid and oxygen introduced as they are through the circulatory organs, I will present the findings of men who have done extensive laboratory work upon the systemic effects of nitrous oxid and ether in general anesthesia. Turck of Chicago showed by experimentation that ether in very small doses was found to lower the hemoglobin percentage in the blood to such a degree that it returned to normal only after a period of from four to ten days. Graham of Chicago has shown by experiment that ether materially reduces the activity of phagocytes. Crile has found distinct organic change in the brain cells of etherized animals. Ferguson of Philadelphia claims the solution of certain fatty constituents of the body, particularly the nerve-cell lecithins, by ether, attributing to this action the slower recuperation of etherized patients. Further, it has been accepted for years that ether may precipitate an acute nephritis, that it is not infrequently the direct cause of fatal pneumonia in operations of the upper abdomen, and that it impairs directly and to a considerable extent the normal function of the liver and entire alimentary tract. The reduction of bodily heat through sweating is very much more marked under ether narcosis than under nitrous oxid, another proof that bodily metabolism is less interfered with under nitrous oxid that under ether. This fact also accounts for the reduction in cases of post-anesthetic pneumonias where nitrous oxid and oxygen has been used.

The results of these comparative experiments show that nitrous oxid administered for long periods of time in full anesthetic dosage produces no demonstrable changes and no residual sequelæ. This sequence of results is in some ways to be expected, since nitrous oxid is eliminated immediately upon removal of the inhaler, while ether requires a protracted period, with many cases of resulting nausea and gas pains. Nourishment may be given following return to consciousness after nitrous oxid, and in fact is often requested by the patient.

While the above applies to surgical anesthesia, it is nevertheless interesting to apply these facts to analgesia—of very much reduced dosage—showing that we may expect no organic changes or uncontrollable symptoms from the repeated use of this anesthetic.

Personally I have used this anesthetic in upward of 3000 cases, ranging from analgesia in dental operations and obstetrics, short anesthesia for extracting, eye, ear, nose and throat surgery, to prolonged anesthesia lasting two hours and ten minutes for major surgery. In this experience I have had no other untoward effects than occasional nausea due to lack of proper preparation in emergency cases and two cases of protracted semi-consciousness, one in a smoker, lasting four hours—which was overcome immediately when the patient was told to smoke!—the other, a woman, lasting one hour and a half, after which time she recovered instantly. I have had three other cases, men, where anesthesia could not be induced without asphyxial spasms, requiring, therefore, morphin injections as an aid to the anesthetic.

NITROUS OXID AND OXYGEN IN OBSTETRICAL CASES.

It might be of interest to outline here the successful use of analgesia in obstetrics. Credit for the development of this technique is given to dental surgery. Its use is unique in safety. The possibilities of its intermittent induction make it probably the most exact form of drug application to produce a definite result and yet at the same time admitting of immediate removal of the drug from the system. In skilled hands nitrous oxid may be termed a panacea for the relief of labor pains. When necessary complete anesthesia may be induced at delivery to avoid all pain. Oxygen is increased one-half to clear any signs of congestion. If congestion is present at birth, oxygen is given to the mother until the condition in the child clears up, which occurs immediately, and the cord is then cut. Proper regulation of oxygen at the terminal stages is extremely important.

Permit me to report here two extreme cases in which I employed analgesia continuously for five and six hours in primiparas, which required high forceps delivery. I then surgically anesthetized these same patients for one hour and fifteen minutes and one hour and a half respectively. Three-quarters of an ounce of ether was given with the nitrous oxid and oxygen for about twelve minutes, as complete relaxation was required. The patients were allowed to recover from the anesthetic when the head was on the perineum. In about ninety seconds I asked the patients to lean down and assist in delivery. This they were able to do, and further manipulation was unnecessary. In such cases the patient is allowed to remain awake, and the placenta comes away under analgesia.

Considerable tearing of the tissues usually occurs in these cases, and immediate repair is necessary. There being no unpleasant effects from the nitrous oxid, the patient takes the anesthetic again—light anesthesia—and in the two cases mentioned three-quarters of an hour was necessary to complete the operations. Therefore in one case there were five hours of analgesia and two hours of surgical anesthesia. The patient was given broth in the afternoon, and some solid food in the evening; there was no nausea or gas pain. The second case, unfortunately, was very complicated surgically. This patient suffered somewhat from surgical shock; post-operative nausea and gas pains were absent. Recovery was prompt in both cases, which illustrates the extreme flexibility of this anesthetic and the absence of detrimental effects.

Nitrous oxid and oxygen supplemented with half to three-quarters ounce of ether is now the anesthetic of choice in difficult cases, and in routine abdominal surgery where a competent anesthetist can be secured. Nitrous oxid and oxygen can be given successfully for the removal of tonsils—the most difficult operation possible under nitrous oxid. The nasal inhaler and mouth tube equalize the pressure in the pharynx. Failure to use this "double-route" method has prevented its general adoption. The conquering of the tonsil operation is a strong argument for the unlimited use of nitrous oxid anesthesia.

In the foregoing I have tried to point out the advantage of using more than one method of anesthesia, or a combination to fit the case in hand. I do not believe the search for any one universal method for the elimination of pain in dentistry is going to be successful. I have tried to treat the subject impartially and to bring out the advantages of all methods.

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The Management of Pyorrhea.

By PAUL R. STILLMAN, D.D.S., New York, N. Y.

(Read before the Plainfield Dental Society, Plainfield, N. J., January 10, 1917.)

THERE is an old European proverb which says, "The water passeth and the stones remain." To paraphrase this proverb, we may say that theories pass and the truth remains. Some theories are true, some have but the elements of truth, while many have as a basis a false premise. However much of error may be incorporated in this paper, it is not for me to judge, but all that I give you is based upon clinical, not laboratory investigation.

There is no histological proof that the soft tissues of pyorrhea pockets repair and become reattached to the tooth, for the reason that no one has as yet obtained a histological specimen of tissues which have thus become reattached. Patients exhibiting such a cure are not easily persuaded to allow a section of the jaw which holds such a tooth in place to be taken from the mouth to prove what seems to many operators a self-evident fact. I know at least a dozen periodontists who are ready to make such claims as to the complete reattachment of the gingival tissue to the tooth root in some manner which obliterates the pocket, and produces what is now believed to be a cure.

The dictionary definition of cure is, "A restoration to health, or the return to a normal state after disease." Using the word in this sense, by macroscopic clinical evidence I am also prepared to prove the statement that pyorrhea may be cured. It is to be sincerely hoped that the histological evidence will soon be at our service, so that there will be no scientific doubt as to its truth.

It has become customary in most of the innumerable types of infection observed in the investing tissues of the teeth to classify loosely as pyorrhea all the several manifestations of disease which have their inception in the subgingival space. The lay public, as well as the profession, seems to have accepted the word pyorrhea and its synonym "Riggs' disease" in this sense, and such is the force of usage that it is doubtful if this misnomer will be corrected in the near future.

In this paper the word pyorrhea will be used in the literal, not in the popular sense. The newer word *periodontoclasia* and its synonym *dental periclasia* have a broader meaning. The definition is—"The process of destruction of the tissues immediately surrounding the teeth." These words embrace all the accepted meaning of the word pyorrhea, while they go still farther in descriptive force. They have been adopted by the American Academy of Periodontology and Oral Prophylaxis, and will soon appear in the dictionary.

Numerous authorities on the dental pathology here under discussion have thrown into their work a pessimistic note when writing under this heading of treatment of periodontal disease. The explanation of this lies in the fact that almost invariably those who have written the most ably on the histology and pathology of periodontoclasia have had slight, if any, success in its practical clinical treatment.

Men of such marked ability in the field of research and investigation as the late G. V. Black, to whom the profession of dentistry, as well as humanity itself, owes a debt of gratitude far greater than it can ever repay, and E. S. Talbot, an eminent authority on dental pathology, when writing on this subject under the heading of treatment seem almost in despair. To illustrate, permit me to quote to you from Professor Black's last work, "Special Dental Pathology," April 1915. In writing on the treatment of chronic suppurating pockets, p. 71, he says: "The treatment generally in vogue has consisted of the removal of deposits of serumal calculus which were found adhering to the cementum where the soft tissues had been parted from it, and the use of antiseptics in an effort to control the discharge of pus. The supposition was that the soft tissues would become reattached to the cementum if they had a favorable opportunity. . . Has this treatment proved satisfactory? Have cases presenting deep pockets on the side of the roots of teeth healed and remained well after reasonable care by the patient? . . . I have myself kept patients on and on in this condition, all of the time having them make frequent visits for inspection and direction as to the cleaning, all the time making frequent use of antiseptics. These cases have apparently done fairly well in the main, but have never gotten well by reattachment of the tissues to the cementum. Some of them would show only occasionally an acute inflammation about some particular tooth or teeth which passed away, leaving the pocket deeper than before. In this slow way the cases became worse." Is it not a pity that this great man was never able to observe the successful work that was being done all about him?

PERIODONTIA AS A SPECIALTY IN DENTISTRY.

What I want to bring to your attention is that there has grown up in the United

States, in Canada, and in many widely separated localities, a considerable group of periodontists who do not agree with the pathological findings of the venerated Dr. Black, and who respectfully differ with him as to his conclusions in the matter of treatment. The fact is, the average case of periodontoclasia, whether pyorrhea or not, may be restored to health. This has been conclusively proved by numerous successes. The fact that the cases cured so far outnumber failures makes the work one to be enthusiastically undertaken. All operators who have been successful in this field, so far as I have been able to learn—and I am personally acquainted with nearly one hundred such men and women—have adopted very much the same principles of treatment. While it is true that types of instruments and technique have not been standardized, an effort to do so is now under way. The fundamental principles which underlie successful treatment must obviously be identical.

The ratio between cause and effect is fixed by an invariable law to which there is no exception—namely, the law that causes are always adequate and effects always commensurate.

We hear much about this method and that, about this drug and that, about iodin, emetin, borated oxygen, sulfuric acid, autogenous vaccines, mercury succinimid, and the vacuum suction device producing cures from the particular isolated virtues which they themselves possess. Every such ascription concerning any one of these agents is of course false. Some of these methods doubtless have elements of virtue, but they are, for the most part, indirect, faulty, inadequate, and usually unnecessary. Their advocates attack the disease from the wrong angle on account of a misconception of the causes which brought about these pathological effects. When a correct diagnosis has been made it remains for the operator to remove the factors which are contributing to and exciting the condition. The periodontist recognizes certain causes which have brought about certain effects, the symptoms of which are as familiar to him as the rash of measles is to a physician.

In a discussion of the management of pyorrhea cases, the study of the factors by which the condition has been produced is obviously the most important consideration. An operator who has clearly in his mind exactly the causes which are responsible for a case under treatment, and the intelligence to remove them, need not worry about the development of technique. This is something that may be attempted and accomplished by all who come to the work with an open mind and average intelligence; efficient technique may be acquired by sustained application.

In these conditions the organic reconstructive forces are inhibited by certain local factors exactly as in strangulated hernia, hemorrhoids, mastoiditis, maxillary sinusitis, etc., and these factors must be removed by the aid of surgery before the reconstructive forces of nature are brought into play. In many types of dental periclasia the removal of these factors is sufficient, while others presenting almost identical obstructive factors will require great effort on the part of the operator to awaken metabolism.

TEETH HOPELESSLY INVOLVED SHOULD BE EXTRACTED.

There are assuredly many individual teeth which, when they present for treatment, have lost much if not all of their vital peridental attachment as well as the alveolar process which supported them. Such teeth should be referred to the exodontist. We who have this type of case referred to us for treatment are frequently mildly criticized for this, but the fault lies not with the periodontists. How many times do we read of a physician being summoned to treat some case when the undertaker or the coroner should more properly have been called!

Nor do I wish to be understood as holding with some writers that periodontoclasia is uninfluenced by coexisting systemic disturbances. Every departure from the normal in any part of the human body doubtless has its direct influence upon the constructive metabolic power of the organism. It is not infrequent to find pyorrhea coexisting with dyscrasia; such cases are subjects for collaboration with a competent internist. The periodontists, while concerned primarily with the conservation or healing of these investing tissues of the teeth, must be alert to the presence of factors opposed to anagenesis.

I have observed many cases which come with a history of gastro-intestinal or renal toxemia, and even tuberculosis or Wassermann positive specific, that have readily yielded to periodontic treatment, and it is not unusual for patients with such coexisting infections to rapidly take on weight when the burden of oral infection has been lightened.

There are many in the profession who do not give credence to statements that pyorrhea may be and has been cured. Some of you, I know, believe with me that they are true; in a few years the whole profession will know it. It is a sad thought to me that such a small number of dentists in each section of the country have any correct knowledge upon the practical side of this work. I am frequently placed in a most embarrassing position when a patient asks, "Do you know Dr. Blank?" "I do, well, and admire him very much." "Dr. Blank has had charge of my teeth since I was a child. Tell me why it is Dr. Blank has not informed me of this condition? I have known for a number of years that my teeth were failing, although I have been to him every six months for most of my life. I have even called his attention to the condition of my gums. Now, I have recently been to him and asked him what he can do for me, and he tells me that nothing can be done, that I must lose all my teeth. After years of faithful adherence to the advice of Dr. Blank, whose standing in the profession is unquestioned, is it reasonable for me to be obliged to search for someone else who is capable of handling this work?" It is indeed embarrassing to answer such questions.

To me the study of these conditions is the most vital which confronts dental science. If we, as dentists, are to serve our *clientèle,* none of us can afford to be without equipment along these lines. Periodontology is a broad subject. There will be found in our literature more that is false than perhaps in any other branch of dentistry; so it devolves upon us to simplify our study by unlearning much and putting into immediate practice such truths as have been proved.

To proceed to the practical or clinical phase, I shall offer you an outline of treatment under my subject, "The Management of Pyorrhea."

The main factors included in the management of cases under this heading are but three, while the sub-factors are so numerous and complex that they would each require a separate heading in special papers of interest only to those who are actively engaged in advanced work along these lines.

The three factors are (1) *Hygiene,* or the correction of the unsanitary conditions of the whole oral cavity. (2) *Traumatic occlusion,* or abnormal stress relation. (3) *Surgical technique,* which includes a consideration of conditions, the pathology of the investing tissues and infected root surfaces, and how they are made aseptic. I bring you nothing original—simply some clinical facts.

HYGIENE.

The general hygienic condition of the mouth should be the first observation when beginning treatment. If the teeth have more or less copious deposits of incrusted tartar let the removal of this be the initial attack. All débris, of whatever nature, on both the exposed and approximal surfaces of the crowns and cervical areas should be carefully searched out and removed by instruments. Crown bands which occupy the subgingival space of infected areas should be removed. The correction of fillings which exhibit gaping or overhanging margins or faulty approximal contact points, the excavation of carious areas where infected débris may find lodgment, and the repairing of these with suitable fillings, the smoothing-up of all rough or imperfect fillings at the necks of the teeth or on crown surfaces which would induce bacterial growth by plaques, and a final polishing of all the coronal and cervical areas with a moist inert abrasive and wood porte-polisher points, are all included in this branch of treatment.

The patient must be taught in detail the duty that devolves upon him to maintain a hygienic mouth. A method of brushing the teeth must be taught which will be effective, any evidence of careless or ineffectual toothbrush technique being corrected at once. The proper use of the toothbrush is one by which the mouth is kept clean, and where no injury is done to the structures. At this time, when the standardizing of the proper technique is in the hands of official committees, I will simply say that any of the methods being taught which prove ineffectual in practice are not correct methods. Any habitual incorrect use of the toothbrush will result in deposits of débris.

There is a certain type or class of patients who know nothing of the joys accruing from a clean, healthy mouth. Some patients exhibit surprise when they are informed that it is important that the lingual surfaces of the teeth need toothbrush care. It should be explained to them that it is necessary to *brush all the surfaces of all the teeth* and the gums adjacent to the teeth as well, that it is an important part of the treatment, and a personal duty which falls entirely upon them individually. Patients who exhibit sustained indifference in this matter are of no interest in my practice, and I politely dismiss them.

The prescribing of a suitable antiseptic mouthwash, I personally believe to be essential. When Dr. G. V. Black advocated the use of plain water as a substitute for all antiseptic washes I quickly adopted his idea, but before three months had passed I concluded that I would restore the mild antiseptic wash which I had previously used, for my cases were fast becoming unmanageable. The experiment was not successful in my practice. All that is required in oral hygiene is a sustained united effort on the part of both patient and operator to keep the mouth clean. It is a difficult task upon occasions, I admit, but success depends upon this first fundamental factor of treatment.

Oral hygiene has been confused by many with oral prophylaxis. The so-called "oral prophylaxis treatment," as it is being taught and practiced, is really a system of mouth hygiene. It is an important work when it is conducted in a rational manner, but it is inadequate as a system for the prevention of periodontic disease. There should be a broader conception of the necessity for the prevention of periclasia. Every dental operation which is not based on prophylaxis is a factor in producing periodontic disease. It is largely because of the great necessity for the correction of dental mistakes that the new specialty of periodontia has developed. Oral prophylaxis in the true sense includes every correct dental operation, where each step is checked up for any possible pathological sequelæ. Oral hygiene is not oral prophylaxis; it is but one of its factors.

TRAUMATIC OCCLUSION.

The second factor is traumatic occlusion. Through lack of appreciation of the importance of this, many earnest students fail. It is an elusive symptom, easily overlooked, and, I confess, has been the cause of most of my own failures. It is the symptom for which I invariably search when examining. I rarely find a periclasia where this factor is not present. I have already written at some length upon this subject, but the material is as yet unpublished, and I take the liberty of interpolating some of it into this paper.

"There is a malrelation of the teeth in occlusion which it is generally inadvisable to correct by usual orthodontic treatment. Traumatic occlusion, as its name implies, is a condition where injury results to the supporting structures by the act of bringing the jaws into closed position. It is an acquired condition, and an almost universally constant symptom in pyorrhea. I cannot place too much emphasis on the necessity of careful scrutiny for its presence. There is no more important symptom in the whole field of periodontia than this. In making an examination, allow the tip of the finger to rest lightly upon the crown of the suspected tooth, and instruct the patient to close the jaws, using a free movement of the mandible, and to bite in all directions, with the intention of bringing force to bear on this particular tooth. Should it be revealed that there is a marked displacement of the tooth when in any of the closed positions—should it be found that the tooth is even slightly displaced in its socket or even receives a shock or thrust, the presence of traumatic occlusion may be considered established. In normal occlusion we observe an admirable co-ordination of jaw with jaw and tooth with tooth. When brought together with any degree of force, the inclined planes of the cusps slide cunningly past each other, as do the blades of correctly adjusted scissors. This force is equally distributed throughout both jaws, and is not brought unduly to bear on one or more teeth. The reverse is to be observed in traumatic occlusion. Every tooth having gingival infection is to be suspected of this improper stress relation, and the condition either established as a fact or eliminated as a factor before surgical treatment is instituted.

"The symptoms of traumatic occlusion should take precedence in diagnosis for periodontoclasia over all other factors, for no matter if the hygiene of the case has been correctly established, no matter if the difficult root-surgery has been carried out with a nicety of technique that would defy criticism, no matter if the suspected contributing constitutional bacterial or protozoan elements have been eliminated, there still remains this impediment to a complete cure.

"I make this statement from experience, and with no fear of ever being obliged to retract it as unsound. *One may look in vain for signs of convalescence in all teeth having traumatic occlusion until the condition has been eliminated by treatment and these teeth given physiological rest.* It is my practice to suspect every case of gingival infection, or any departure from the normal in either the line of curve or contour of the gingival border, of being aggravated and complicated by this condition, and it is my experience that persistent infections in post-operative cases—presupposing, of course, that the surgical technique and hygienic conditions are satisfactory—will usually confirm this suspicion. On account of a drifting and readjustment of the teeth, traumatic occlusion frequently reappears months after it has been entirely corrected."

It will be impossible for me to con-

Fig. 1.

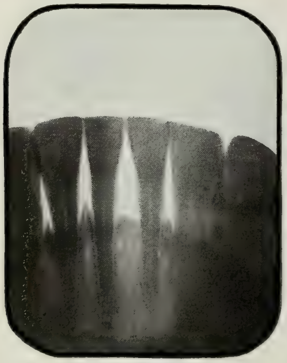
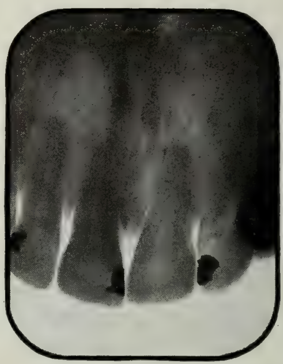


Fig. 2.



Radiographs of lower and upper anterior teeth in the same mouth, showing the effects of traumatic occlusion. Notice rarefication over both central incisor regions.

sider the various symptoms induced by traumatic occlusion in the limited time at my disposal.

"By far the most enlightenment on the fundamental principles of harmoniously functionating dentures has come to me through the observations of Gysi, who applied the true mechanical principles of the anatomy of the jaws in his endeavor to overcome certain difficulties in the construction of artificial teeth for the edentulous mouth. Gysi found that by a correct remodeling of the occlusal surfaces of porcelain teeth and by reproducing the correct anatomical measurements and movements with the aid of his instruments he was able to produce artificial dentures whose harmony of occlusion was equal to nature's own perfection. It is by applying these principles in treatment that the periodontist is able to correct traumatic occlusion.

"Grinding of the teeth for the correction of traumatic occlusion is fraught with many difficulties and dangers. It should always be done under conditions that predetermine exactly where to grind. For this reason we use carbon paper to indicate the exact points of occlusal contact. The carbonized spot is ground and again marked, and this reground; this process is repeated until the trauma is entirely relieved. Teeth that have been correctly treated for traumatic occlusion never present a mutilated or grotesque form, but appear as when the change in form has been brought about by natural attrition. They should give one the impression that they are serviceable teeth. By using small stones, which should be kept constantly wet, and always guided by the carbon-paper marks, it will be found that many cases which seem impossible to treat with success may thus be restored to normal health and function."

SURGICAL TECHNIQUE.

The third factor is surgical technique. The problem of instrumentation for pyorrhea is a familiar subject. It is difficult to describe how any technique is accomplished. It would be impossible to describe to one who had never handled a violin how the tones were made or to give him an adequate conception of what a violin virtuoso could accomplish with his technique. I do not hope to describe to you any particular set of instruments nor how to use them. The knowledge of types of instruments may be secured from instrument-makers or their catalogs.

What seems important in the treatment of periclasia is to describe what the intention of the operator is, what he is attempting to do with these delicate instruments. Let us first be assured that we have always an instrument that has a keen cutting edge; dull or misshapen blades are serious impediments. Let us always keep in mind that an ultra-sharp instrument is capable of doing greater damage than a dull or blunt one, and that the infliction of grooves or scratches upon the cementum surfaces or laceration of the investing tissues is inexcusable. Pyorrhea instruments, as they are called, are intended to enter the pocket at its detached border and to proceed by steps until the whole area of the infected tissue on the root surface has been curetted, leaving this surface as clean as a billiard ball, and equally as well polished. It is not necessary to proceed in these cases beyond the area of the pocket. Before the operation the area of each pocket should be explored with a flat blunt probe, and the exact extent of detached root surface which is to be curetted, together with the general outline of the pocket, recorded on a chart. The curetting instrument is next introduced at the cervical area of the root, and with a pull, or toward-the-handle stroke, the infected surface is denuded of its pathological peridental membrane. Other débris will usually be encountered, such as serumal calculus or granulations, which have been designated by some writers as "etched surfaces." As the peridental membrane lies next to the cementum on the tooth-root surfaces, it is obvious that when the septic areas of this necrotic tissue have been curetted no tartar nor serumal calculus will remain.

The technique in periodontia is just

as simple to understand as the technique in any other branch of dentistry, but is perhaps more difficult to acquire by those who have been trained only along the lines of operative and mechanical dentistry.

The instrumentation for pyorrhea is pure surgery, and this idea should be well fixed in the mind of the operator. Do not employ escharotics or antiseptics, nor introduce any substance in the pockets to "aid in healing": such practice has been abandoned in surgery. All that is necessary is to keep the external field clear of blood-clots by occasionally flushing with a mild spray or wash. Instruments must be made aseptic by sterilization. Surgical asepsis is not possible in the mouth, and in this work it appears from experience to be unnecessary. I attribute this to the hemorrhage and bacteriolysis which has been excited by the advancing infection. The blood flow in mosts cases receiving treatment is profuse, and the invading organisms which are disturbed by the instrumentation are thus flushed out. It is believed that the mucous secretions also exhibit bacterial growth. In any event, and whatever the scientific reason, these cases do not become infected, as other surgical surfaces frequently do. There has never been a case of periodontal post-operative infection in my experience.

A healthy gingiva presents a marginal edge which overlaps the gingival space with almost knife-blade thinness. The septal tissue fills the interproximal space, ending in a point at the approximal contact points. Its surface forms an inclined plane in the approximal embrasure which prevents lodgment of any food particles in the interproximal space, and while it rapidly recovers from an occasional trauma, is so sensitive to the continued pressure of any foreign substance that it almost becomes hyperemic. It is therefore essential that we should never use gold plate of even 28 or 30 gage for bands which are to extend into this domain. It is true that if this septal tissue is not permitted to reign supreme in its own domain it will immediately abdicate. We may readily appreciate that if this tissue becomes injured or swollen the thickening of its marginal edge forms a shelf-like obstruction for food to strike against in mastication, and thus continuous injury is sustained. The normal gingiva never appears as if pushed back, heaped up, or displaced.

The gingival curve is still another diagnostic sign which, although not always constant, should be noted. The normal gingival border from the eminence of the septal structure at the distal approximal embrasure, across the labial and to the distal eminence, always describes a characteristic parabola, and any departure from this curve denotes a pathological disturbance. It is at times the only symptom exhibited, and usually denotes traumatic occlusion, and always infection. Such cases yield to treatment, and the normal curve may usually be established.

There is no more important diagnostic sign of gingival infection than the color of these tissues. A healthy gingiva always presents a translucent appearance. It is never opaque, and it has no deep or venous reds, no purple or blue shades, except where there is pigmentation, as in certain Caucasian brunettes and in negroid types. We are unable to describe colors except by comparison. I would compare the color of normal gingivæ and gum tissue to the translucent pink of the tropical conch shell.

CARE OF CASES DURING CONVALESCENCE.

There is a period in the treatment of all cases which is particularly trying to the operator—the convalescent period, the time when the disturbing factors have been assuredly eliminated and still the looked-for healthy appearance is not present. If you are sure that all that has been done has been well done, that you have not failed at some point in the treatment, be optimistic, and wait. To the trained observer wonderful constructive changes take place in the period from six months to a year after the beginning of the treatment. The inexperienced and unskilled operator may always be rewarded by visual improvement in any case which he undertakes to treat, but to the trained operator is given the pleasure of seeing changes in tissues which unmistakably signify a return to health.

Not enough importance has been placed on the management of a treated case during the period of convalescence. I can recall no case where the treatment has been discontinued directly after the factors have been eliminated by operative treatment, where the results were satisfactory. There may be operators who are so expert in technique that they are able to perfectly curet the diseased root surfaces of any tooth in one continuous operation, and in a manner to preclude subsequent infection in pockets. This is the result for which I strive in every instance; it is the ideal, but I freely confess to you that the percentage of cases so treated in my practice are not in the majority. In cases thus successfully operated upon there follow unmistakable signs of healing by first intention, and an accompanying suppression of all symptoms of infection. In the cases which do not show 100 per cent. of success in the initial operation the attack upon the symptoms is again made, and a secondary operation, exactly as in the first instance, or if necessary a third, is performed—for these principles of treatment are based upon a foundation of truth, and when failure results one should look for an error in either diagnosis or in technique.

FIG. 3.

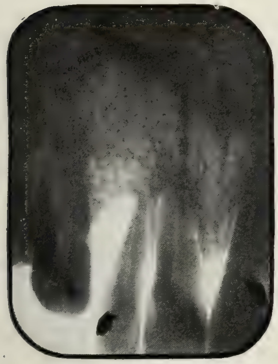


FIG. 4.

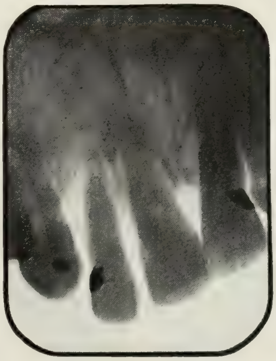


FIG. 5.

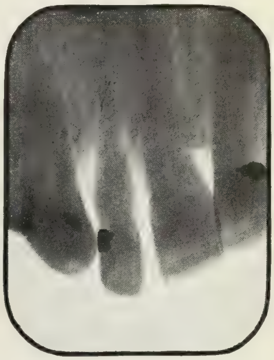


FIG. 3: Radiograph taken on the day the lateral root surface was made aseptic. Note depth of pocket. Pulp vital.

FIG. 4: Radiograph of same tooth two months later. Shows some bone regeneration near apex of lateral.

FIG. 5: Radiograph of same tooth six months later. Alveolar process is still in course of repair. Lateral incisor is firm and useful.

The period of convalescence I should conservatively place at six months subsequent to a final successful operation. Metabolic changes occur during this period the results of which seem to indicate that every cell which had previously been an integral part of this structure in its diseased state had now been replaced. Health radiates from these structures when they are normal, and the tissues assume a translucence and brilliancy which is unmistakably due to a regeneration of cell life.

It is a generally recognized biological belief that vital organic structures have the potential ability to repair by generating new structures to replace those which have been lost through accident or disease. The evidence of this regeneration of alveolar tissues to replace that which has been lost has been repeatedly exhibited upon the stereopticon screen as radiographic evidence to support this theory. Where operations in surgery have been done on either the osseous or vascular structures, cell regeneration with its structural replacements has occurred. We may readily deduce that the alveolar structures have the same inherent osteogenesis; that mesoblastic proliferation is to be expected in these tissues as in any other structures of the organism.

THE ALVEOLAR PROCESS NOT A TRANSITORY STRUCTURE.

We have been told that the alveolar process is a transitory structure which must inevitably be lost, together with the teeth which it holds. Such teaching is unsound. Are we to believe that at some uncertain period there is a physiological process by which this structure must become destroyed or resorbed, by a process, let us assume, similar to that of the roots of deciduous teeth previous to exfoliation of their crowns? Such a postulate in view of the evidence to the contrary is manifestly unsound. The loss of this structure is not due to physiological causes.

The débris which is the irritating source of infection in periodontoclasia lies upon the tooth root, and rarely penetrates into the alveolar process. The surgical means employed for the removal of necrotic areas on the root surface render the field of operation aseptic by the liberation of normal blood into the pocket. The phagocytic action of the leucocytes destroys the bacteria, the loitering organisms of infection, and the waste products which have been disturbed by the instruments. The anagenesis is stimulated coincidently, and it seems reasonable to believe that it is by these well-known processes that teeth which have become loosened through the disintegrating action of disease are again restored to functional rigidity. (See Figs. 3, 4, and 5.)

I wish to call your attention to a paper by Dr. T. Sidney Smith, which appeared in the June 1916 *Dental Items of Interest*, in which he advances some new pathology relating to reattachment to the tooth root of once separated gingival tissues, also to a paper by Dr. Arthur H. Merritt, which appeared in the December 1916 *Journal of the Allied Societies*, where this same theory of reattachment after treatment for pyorrhea is maintained.

All will soon be obliged to admit that a cure does not result unless there is a complete obliteration of the pocket and a reattachment of the gingiva to the root of the tooth, when the gingival circulation becomes normal, and takes on a healthy color.

Periodontoclasia is the greatest and most formidable pathological attack to which teeth are known to be liable. It is fifty per cent. more destructive to the teeth than is caries. It proceeds by destroying the very foundations, allowing the teeth to exfoliate from sheer lack of support. It seems opportune that some intensive study by the whole profession should be started in periodontology, and that a greater interest in prevention of the premature loss of teeth should be inaugurated. This has been done in the branches of root-canal work, bridge work, and prosthetic dentistry, while the field of periodontia is almost virgin in the richness of its problems. Its literature as yet has only touched the most elementary phases of this subject. Thousands upon thousands of human beings are being deprived of the health-giving benefits of the function of mastication, while at the same time they suffer from toxic absorption due to the somnambulistic state of the dental mind.

Medical investigators are powerless in this field, which dentistry has staked as its own particular claim, and then has neglected.

The fact that this infection lies deep, and is impregnably intrenched against therapeutics; that the hope for cures arising from the pharmaceutical or bacteriological laboratory are, so far as past results have proved, too inadequate for present consideration, should at this time stimulate a general interest in the one method of combating this disease which has to its credit the first and only cures.

115 BROADWAY.

Changes Produced in the Blood by Nitrous Oxid-Oxygen Anesthesia:

A REPORT OF RESEARCH

Conducted under the auspices of the Anesthesia Committee of the Academy of Stomatology of Philadelphia.

By THEODORE D. CASTO, D.D.S., Philadelphia, Pa.,
CHAIRMAN OF THE COMMITTEE.

(Read before the Academy of Stomatology of Philadelphia, December 19, 1916.)

THE experimental animals were albino rats (*Mus Norvegicus,* var. *Alba*) obtained from the Wistar Institute, litters of from three to six animals of uniform size and weight being used.

In a previous paper by the author,* it was reported that nitrous oxid and oxygen anesthesia in man gives rise to a decrease in the erythrocytes; thirty or forty minutes after the anesthesia a tendency was noted for the count of erythrocytes to return to its normal value as determined prior to anesthesia.

In a paper before the Panama Pacific Dental Congress† the writer described the hematological changes in rats under nitrous oxid and oxygen anesthesia. A further report on the latter research is given in the present communication; the influence of anesthesia produced by nitrous oxid and oxygen upon the degree of alkalinity of the blood has also been studied.

The carbon dioxid—carbonic acid—content of the alveolar air and of the blood in a sense controls respiration, since carbon dioxid stimulates the respiratory center. According to Haldane,‡ under normal conditions the carbon dioxid content of the alveolar air has an almost constant value of 5.6 per cent. *Carbon dioxid forms by far the greatest portion of the products of metabolism which are acid in nature.* Formed in the tissues, it is absorbed by the blood plasma and carried to the alveoli of the lungs; here it is largely replaced by oxygen in the gas exchange, and the blood, as it leaves the lungs, normally contains in solution air which has a carbon dioxid content of 5.6 per cent. If the carbon dioxid content of the circulating blood and of the alveolar air becomes abnormally high, the respiratory center is subjected to an added stimulation, and causes a deeper and more frequent respiration. As a result of this ventilation the excess of carbon dioxid is expelled through the lung, and the normal relations between acids and bases are restored in the blood. The hydrogen-ion concentration or degree of alkalinity of the blood is thereby kept approximately constant.

If, through disease or medication, acids which are not excreted through the lungs are formed and enter the blood stream, more rapid and deeper breathing may compensate their presence and maintain the normal alkalinity of the blood. Should the quantity of these non-volatile acids be such that increased respiration does not maintain the normal alkalinity of the blood, the condition known as acidosis exists, and the blood becomes neutral or even acid in reaction.

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* DENTAL COSMOS, lvii, 881 (1915).

† *Dental Items of Interest,* xxxviii, 595 (1916).

‡ *Science,* N.S.xliv, 624 (1916).

HYDROGEN-ION CONCENTRATION OF THE BLOOD.

In physical chemistry the reaction of a solution is expressed by its hydrogen-ion concentration. This term requires an explanation. Study of solutions has shown that when a compound belonging to the group of electrolytes—which includes practically all acids, bases, and salts—is dissolved in pure water, the compound undergoes electrolytic dissociation into a positively charged ion and a negatively charged ion; the solution acquires the power to conduct the electric current, and the positively charged ions and negatively charged ions travel with the current to the negative pole and the positive pole respectively. Thus hydrochloric acid yields the positively charged hydrogen ion H^+, and the negatively charged chlorid ion Cl^-. In fact all acids yield the H^+ ion. On the other hand, all bases yield the negatively charged hydroxyl ion $(OH)^-$.

When hydrogen ions predominate in a solution, it is acid in reaction; when hydroxyl ions predominate, it is alkaline in reaction. When the hydrogen and hydroxyl ions are present in equal quantities, the solution is neutral in reaction; this condition exists in pure neutral water which is slightly dissociated into hydrogen ions and hydroxyl ions. One liter of water at a temperature of 20° C. contains 0.0000001 (one ten-millionth) gram of hydrogen ions; using the nomenclature of standard solutions, and volumetric analysis, this represents a hydrogen-ion concentration of 0.0000001 normal, which may also be written 10^{-7} normal, or, as suggested by Sorensen,* p H 7.

Since the number in the term p H is the negative exponent in the logarithmic statement of the hydrogen-ion concentration, when the number is less than 7, the solution is acid; when it is greater than 7, the solution is alkaline. Thus the hydrogen-ion concentration is p H 6 in a solution which has an *acidity* 0.000001 normal, and is p H 8 in a solution which has an *alkalinity* 0.000001 normal.

METHODS OF DETERMINING HYDROGEN-ION CONCENTRATION.

The two commoner methods for the determination of the hydrogen-ion concentration of a solution are the electrometric method, using a gas chain or hydrogen electrode, and the indicator method. In the indicator method a suitable indicator is added to the solution of unknown hydrogen-ion concentration, and to a series of standard solutions of which the hydrogen-ion concentration is known, having been ascertained by the electrometric method. By matching the color of the unknown solution against the known solutions, the hydrogen-ion concentration of the unknown solution is readily determined. The chief obstacle to the application of this method to blood has been the color of the blood itself. This obstacle has been overcome in a method recently devised by Levy, Rowntree, and Marriott,* who dialyzed the blood contained in a celloidin sack against physiological salt solution, and determined the hydrogen-ion concentration in the dialysate, which is free from proteins and blood pigments, by the colorimetric method, using phenol-sulfone-phthalein as the indicator; this compound "exhibits definite variations in quality of color with very minute differences in hydrogen-ion concentration between p H 6.4 and 8.4." For standards of known hydrogen-ion concentration they use a series of solutions; each contains mono-potassium phosphate and di-sodium phosphate mixed in definite proportions. Their procedure renders it possible to determine the figure in the p H to a tenth, and at times, by interpolation, to a twentieth (0.05) of a unit.

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* *Ergebnisse der Physiologie*, xii, 393 (1912).

* *Archives of Internal Medicine*, xvi, 389 (1915).

TABLE 1.

	Erythrocytes.			Leucocytes.			
Exp. No.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Incr.
20	7,020,000	5,856,000	16	4,150	5,000		20
22	7,318.000	6,056,000	17	9.500	8,500	10	
23	4,440,000	3,004,000	32	4,150	14.750		255
25	6,392.000	5,456,000	15	7,000	4,500	35	
26	6.988,000	3,600,000	48	5,000	3,000	40	
29	6,192,000	3,792,000	38	7,500	13,000		73
30	5,792,000	4,768,000	17	5,000	7,000		40
32	6,792,000	2,008,000	70	5,500	8,000		45
34	4,520,000	1,504,000	66	10,000	7,500	25	
35	2,480,000			3,000			
36	5,904,000	5,608,000	11	9,000	10,000		11
37	4,816,000	3,448,000	28	9,500	7,500	21	
38	6,400,000	3,832,000	40	18,000	20,000		11
41	6,288,000	6,048,000	3	5,500	6,000		9
44	4,296,000	2,568,000	40	4,000	19.500		137
45	4,648,000	3,848,000	17	4,000	3,000	25	
46	4,756,000	3,928,000	17	7.500	7,000	6	
51	5,840,000	4,632,000	20	20,000	18,500	7	
53	5,392,000	5,168,000	4	27,000	13,500	50	
55	5,152,000	5,096,000	1	19,000	12,000	36	
57	5,592,000	5,448,000	2	17,000	10,000	42	

Maximum	70
Minimum	1
Average	25

For the details of their procedure, reference should be made to their original report.

Marriott* has modified this method, so that, in addition to the hydrogen-ion concentration of the blood, the alkali reserve of that fluid is also determined. The procedure is quite simple. After p H has been determined in the usual manner, a current of air is forced through the dialysate from the blood

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* *Archives of Internal Medicine*, xvii, 840 (1916).

TABLE II. PERCENTAGE OF LEUCOCYTES.

Exp. No.	Polynuclear Neutrophiles.				Lymphocytes.				Transitionals.				Eosinophiles.			
	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Percentage Incr.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Percentage Incr.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Percentage Incr.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Percentage Incr.
20	36.5	34	6		45.4	48		5	11	13		18	7	5	25	
22	26	21	19		68	72		5	6	24		300				
23	17.1	5	75		61.4	74		20	14	11	21		7	10		42
25	5				55											
26	34	33	2		46	54.5		18	14	9.5	80		6	3		50
30	26	25.7	1		41	56.5		37	23	12	50		10	5.7	43	
32	49	23	53		33	60		81								
34	35	9	74		51	59		15	14	25		54	0	7		
36	48	47	2		41	41			7	8		14	4	3.5		
37	43.5	31	34		41	40	2		8.5	12		41	7	7		
41	50	20	60		41	82		100	9	11		22				
45	22	3	90		69	91		31	7	6	14		2	0	2	
46	37	30	19		50.5	63		24	11	3.5	68		1.4	3.5		150
51	31	31			62	54	12		7	9		20	0	6		
53	52	18	55		39	65		66	5	15		200	4	2	50	
55	36	50		39	57	35	38		9	13		44	1	2		100
57	27	43		58	63	48	21		8	7	12		2	2		

for a period of three minutes in order to expel the absorbed carbon dioxid; the dialysate is then compared with the standards of known hydrogen-ion concentration for a second time in order to determine its hydrogen-ion concentration. This residual hydrogen-ion concentration is termed R p H; the difference between R p H and p H represents the alkali reserve of the blood, and also is a measure of the carbon dioxid content of that fluid. As the alkali reserve of the blood diminishes and the condition of acidosis is approached, the

TABLE III PERCENTAGE OF POLYNUCLEAR NEUTROPHILES.

	With 1 Segment.				2 Segments con.				2 Segments.				3 Segments.				4 Segments.			
Exp. No.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Incr.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Incr.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Incr.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Incr.	Before N_2O+O_2	After N_2O+O_2	Percentage Decr.	Incr.
20	16.4	6	60		4	11		175	68	61.2	1		11.4	20.4		7		1.4		
22	21	4	80		23	24		4	52.5	56		6	3.5	16		71				
23	14	0			5	0			62	50	79		14	50		27	5	0		
25	0	0			0	0			75	0			25	0			0	0		
26	2.5	8		220	31	14	54		49.2	60		21	16	16			1.2	2		66
30	4	3	25		7.2	0			70.2	91		3	14.4	6	5		4	0		
32	3.6	2	4		8	6	25		58.6	63		7	28.8	27	6		1	2		100
34	0	0			3	12.5		316	45.5	62.5		3	48.5	19	6		3	6		100
36	4	3.2	2		17	8.5	5		57	64		12	21	22.3		6	1	2		100
37	4	2.1	4		4	5.3		3	62	48	22		29	38.2		31	1	3.2		22
41	2	16		7	3	0			73	64	12		22	20	19					
45	11	20		81	8	0			70	81		15	11	0			0	0		
46	4	6		50	5	4.5	1		74	67	9		17	19.4		14	0	3		
51	15.5	9	42		64.4	6.5	90		4.4	62		131	15.5	19.5		3	0	3		
53	2.6	3		15	8.7	3	65		66	83		25	22.7	11	51		0	0		
55	0	0			0	0			68.4	63	7		31.4	36		14	0	1		
57	4	4.3		75	2	5.3		165	72	73.4		19	22	17	22					

TABLE IV

Normal Rats.

Exp. No.	p H	R p H
21	7.4	7.65
24	7.34	7.9
27	7.3	7.9
31	7.15	7.7
33	7.45	8.4
39	7.5	8.5
40	7.5	7.9
42	6.6	7.9
43	6.6	7.2
47	7.5	8.4
52	7.4	7.9
54	7.3	7.6
56	7.6	8.4
58	7.6	8.4
59	6.6	7.3
Maximum	**7.6**	8.5
Minimum	**6.6**	7.2
Average	**7.25**	7.95

Rats Anesthetized with N_2O+O_2.

Exp. No.	p H	R p H
20	7.3	7.5
22	7.3	7.4
23	7.0	7.2
25	7.25	7.65
26	7.3	8.0
28	7.25	7.7
30	7.0	7.3
32	7.4	8.6
34	7.1	7.4
35	6.8	7.1
36	7.0	7.5
37	7.25	7.8
41	7.4	8.0
44	6.6	6.6
45	7.3	7.8
46	6.6	7.7
53	7.5	7.8
55	7.0	7.6
57	7.1	7.6
Maximum	7.5	8.6
Minimum	6.6	6.6
Average	7.1	7.6

numerical value of R p H becomes lower than normal.

METHOD OF EXPERIMENTAL PROCEDURE.

The animal to be anesthetized was placed on a table under a bell jar. The supply pipe for the gas was carried up through a hole in the table and allowed to enter 2½ inches above the top of the table. The exhaust tube was even with the table top, and had an elbow under the table so that the escaping gas might be collected for analysis. The whole appliance was sealed by pouring melted paraffin around the edge of the bell jar, an airtight apparatus being thus secured into which the gas was readily delivered. In this chamber the animal could be kept under constant observation, and anes-

(Continued on p. 431)

Rat 25. July 23, 1916.

Time	N_2O	O_2	Respirations	Comment
1.10	85	15		Operators left for lunch
2.20			96	Partial paralysis of hind legs. Movement difficult
2.40	92	8	120	
2.50			135	Increased paralysis of hind legs.
3.10	95	5	115	" " " legs.
3.15				" " " "
3.27			120	Drags hind legs.
3.35	97	3		
3.36			100	Respiration a little labored. Good anesthesia.
3.37	80	10		Collapse.
3.38	90	10		Return to anesthesia.
3.40			108	
3.42	90	4		Return to consciousness.
3.43	100			
3.44			150	
3.45				Cyanosis of tail and hind legs.
3.53			116	
3.54	97	3	64	Labored Breathing.
3.55			100	Collapse.
3.57	90	10		Complete anesthesia.
3.59			80	
4.02			80	Deep anesthesia,..
4.06			116	
4.07	97	3		
4.12			112	Deep anesthesia.
4.14			60	" "
4.16	100		170	" "
4.17			17	Died.

Blood taken from tail.

	Before $N_2O + O_2$.	After $N_2O + O_2$.
Erythrocytes	6,392,000	5,456,000
Leucocytes	7,000	4,500
Polynuclear neutrophiles	5%	
Small lymphocytes	49%	55%

	Before $N_2O + O_2$.	After $N_2O + O_2$.
Large lymphocytes	6%	6%
Transitional	36%	37%
Eosinophiles	4%	2%
2 segments	75%	
3 segments	25%	

(Macrocytes and microcytes present.) p H, 7.25. R p H, 7.65.

RAT 20. *July 22.*

Time.	N_2O.	O.	Resp.	Comment.
2.45	75	25		
3.00			68	
3.00	80	20		
3.08			72	
3.15	87	13		
3.18			104	
3.24			80	Approaching anesthesia.
3.25	90	10		
3.33			110	Tendency to drag.
3.40	95	5		
3.42			106	
3.50			160	Cyanosis of tail and legs.
3.53	100	0		
3.58			100	Inactive at bottom of bell jar. Deep cyanosis of all limbs and of the ears.
3.58	90	10		
4.10	100	0		
4.13				Died.

RAT 22. *July 22.*

Time.	N_2O.	O.	Resp.	Comment.
4.34	75	25		
4.40	80	20		
4.45			134	
4.55	87	13		
4.58			128	
5.10			104	Semi-paralysis of hind legs.
5.20			132	Complete paralysis of hind legs; cyanosis of tail.
5.20	90	10		
5.30			164	Very restless, dragging all legs.
5.35				Cyanosis almost complete.
5.35	75	25		
5.38				Practically restored; cyanosis of tail and right paw.
5.38	90	10		
5.40			160	
5.41	95	5		
5.43	100	0		
5.45				Struggling.
5.46				Dead

RAT 23. *July 23.*

Time.	N_2O.	O.	Resp.	Comment.
10.54	80	20		
11.00			76	
11.05	85	15	66	
11.15	90	10		
11.25				Paralysis of both hind legs. Still conscious, but drowsy and weak; cyanosis of tail.
11.30			81	
11.35				Shows decided sensibility. Tries to remove paraffin adhering to hind legs.
11.40			64	
11.45	95	5		Resp. 68 immediately on changing gas.
11.52			86	
11.55				Bloodvessels engorged. Very quiet.
11.57			96	Practically complete paralysis of hind legs. simply dragging them as he moves around cage. No ability or disposition to use legs.
12.00				Not much cyanosis; a little in feet and tail.
12.10				Eyelids drooping. Breathes entirely through nose. Mouth closed. Still fairly active at times.
12.14				Marked cyanosis. Can still move about, but cannot even drag hind feet.
12.15			114	Lying flat on bottom of cage. Inability to move.
12.20			40	Resp. spasmodic.
12.21			24	
12.24			60	Allowed high percentage of contents of jar to escape.
12.26			84	Complete anesthesia.
12.35	100	0	88	Closed inhaling hole and cut off all O. Breathing very labored.
12.38			40	
12.39			38	
12.40			24	
12.42	90	10		Removed cotton from hole and allowed gas to escape from jar; gave all O for 2 min. 15 sec. Resp. 24, 1½ min. after all O is given. Spasmodic breathing.
12.45	80	20	40	

Time.	N_2O.	O.	Resp.	Comment.
12.50	100	0		
12.56				Spasmodic breathing, very labored. Dying.
12.58			0	Resp. ceased. Eyes still wide open.
1 P.M.				Rat died.

RAT 26. *July 19.*

Time.	N_2O.	O.	Resp.	Comment.
2.45	80	20		
2.52			72	Notice a slight change in rat. Feels effect of gas.
2.55			84	Rat very quiet.
2.56	92	8		No signs of anesthesia.
2.58			84	Very placid.
3.02			42	Easily disturbed by movement of brush.
3.10			64	Not excited by movement of brush. Looks for air.
3.15				Rat is again active.
3.18	95	5		
3.20	100			
3.21				Drags hind legs.
3.23				Does not move on irritation with brush.
3.24			96	
3.37			104	Cyanosis.
3.42				Rat is anesthetized.
3.44			128	Allowed a little O.
3.50				Complete anesthesia in progress.
3.52			120	
3.58			120	Has not moved for about 20 min.
3.06			112	
3.08				Disposition to move head.
3.11			120	Moved slightly, changing position.
3.15				Getting all N_2O again.
3.16			160	Distended bag fully on apparatus. Rat very active.
3.18				Collapse. Blood count taken. Restored and allowed to live until the next day.
	July 20.			*(Second administration.)*
				Blood count taken; blood normal.
10.45				Full atmosphere of N_2O. Jar not sealed at this time.
10.49				After 4 min. signs of collapse.
10.50			146	Cyanosis of tail and limbs. Spasms of tail and limbs. Resp. fails rapidly.
10.51				Breathing ceased.
10.52				Dead.

RAT 28. *July 29.*

Time.	N_2O.	O.	Resp.	Comment.
4.30	95	5		
4.34			120	Dragging hind legs. Shows effect of gas; immediate signs of anesthesia.
4.35	85	15		
4.36			72	Very uncomfortable.
4.37	80	20		
4.38				Coming around again.
4.40			84	Restless and excited. Moves around; drags hind legs. Cyanosis.
4.43	92	8	80	Still moving around.
4.48	95	5	84	
4.52				Very drowsy. Does not respond to loud noise. Closed exhaling valve with wax.
4.54			116	Very placid.
4.56	80	20	125	Very deep anesthesia. Near collapse. Opened up valve.
4.59			124	Very irregular breathing. No response to noise.
5.00	92	8		Quite active.
5.02	95	5		Valve closed up again.
5.05				Cyanosis of tail and ears. Valve opened again.
5.07			120	Valve closed. Very quiet.
5.10			60	Breathing labored.
5.11				Anesthesia.
5.15			60	
5.17			420	Collapse. Getting slower with each resp.
5.18			120	Bell jar was raised and tube applied to face; gave all O with almost immediate response.
5.20	50	50		
5.25	95	5	120	Animal turns over and becomes active, because bell jar was raised and air has entered.
5.27			100	
5.30	92	8		
5.33			148	Valve is open.

Time.	N_2O.	O.	Resp.	Comment.
5.36	50	50		Resp. falls rapidly.
5.38				Collapse. Direct contact with tube of O to face; immediate response; becomes active. Entirely restored. Allowed N_2O pure for two minutes; collapse.
5.45	80	20	130	Moves again.
5.46	95	5		Becomes very active.
5.50				All N_2O direct. Becomes drowsy. Resp. very fast, then a sudden drop; N_2O bag is distended.
5.56				Collapse.
6.00				Dead.

Rat 29. *July 30.*

Time.	N_2O.	O.	Resp.	Comment.
11.13	90	10		
11.14			80	Very quiet.
11.20			88	
11.25				Cyanosis.
11.29			96	Legs dragging. Very drowsy.
11.35				Not disturbed by noise; resp. failing.
11.36	50	50		Restored.
11.37			146	Sighing resp.
11.40	90	10		Responds to noise.
11.42			96	Exhaling valve opened.
11.45				Profound anesthesia. Resp. failing.
11.46	50	50	64	Collapse. Direct O. Had stopped breathing for ½ min. Resp. is restored almost immediately.
11.51	50	50		
11.52	90	10		Fairly active.
11.55				Valve closed.
11.56			120	
12.05				Very lively. Responds to noise, etc. Air can get in under bell jar.
12.05	95	5		
12.15				Decidedly alive. Gas had been turned off 15 min. by mistake.
12.21	95	5	120	Responds to noise.
12.25			92	
12.30			120	Response to noise. Walks around cage, dragging legs.
12.34				No response to noise. Deep cyanosis of tail and legs.
12.35	92	8		Becomes lively with this mixture.
12.38	100		100	
12.40				Resp. failing.
12.41	80	20	96	
12.42	100			
12.44			96	
12.49				Resp. failing rapidly. Spasmodic contraction beginning at lower part of body and working to head.
12.51				Stopped breathing; slight quivering of lower part of body.
12.52				Dead.

Rat 30. *July 30.*

Time.	N_2O.	O.	Resp.	Comment.
3.34	85	15		Valve closed. A very active rat.
3.40			104	
3.45	90	10	92	Begins to show effect of the gas.
3.46				Response to noise; begins to drag legs. Gas acting very quickly.
3.47				No response to noise; lies quiet. Valve opened.
3.50			84	Anesthesia ensuing. Moves head slightly, not body. Valve closed.
3.52				Walks around cage, but no power in hind legs. Valve opened; revived immediately.
3.53			104	
3.56	80	20		Failing rapidly, but becomes lively again.
4.00	95	5		
4.05			120	Still fairly active, but shows effects.
4.07				Valve opened.
4.10			104	Seems content in this atmosphere (valve open), but is rather drowsy; slight response to noise. Cyanosis.
4.15				Marked cyanosis. Becomes more drowsy.
4.17	97	3		
4.18			100	Begins to fail.
4.19	95	5	80	Profound anesthesia.
4.20	97	3		
4.22			80	Valve closed. Begins to go off again.
4.25			104	
4.33			84	Valve opened.
4.34	90	10	42	

Time.	N_2O.	O.	Resp.	Comment.
4.35			96	Moves head slightly with noise; becomes lively in 1½ min.
4.37	95	5		
4.39				Valve closed; rat becomes drowsy.
4.40			120	Valve opened.
4.43			104	
4.44				Valve closed.
4.46			76	
4.49				Failing resp., slight tremor of lower portion of body. Valve opened. All O for 1 min.; resp. became 60.
4.52	95	5		Valve still open.
4.56	97	3		Valve closed. Profound anesthesia, until—
5.12				Resp. failed; stopped breathing. Gave pure O for 1 min., then returned to normal for 1 min.
5.15	95	5		
5.16				Valve is open.
5.24				Resp. failing.
5.25				Turned off. Resp. 12. Collapse.
5.27				Dead.

Rat 32. *August 5.*

Time.	N_2O.	O.	Resp.	Comment.
3.06	80	20		Valve closed.
3.09	90	10		
3.10			104	
3.12				Paralysis of hind legs. No response to noise; still moves about.
3.15	95	5	116	
3.17				Marked signs of trouble with hind legs.
3.18			100	
3.19	97	3		Still moves about.
3.21			120	
3.24				Marked cyanosis of hind legs and tail. Complete anesthesia.
3.25	95	5	80	First signs of collapse, labored breathing.
3.26			80	
3.27	96	4	88	
3.30			120	Able to move head.
3.35				All nitrous oxid.
3.36			116	Walks around cage two or three times, and then shows effect of exertion and struggling.
3.37	95	5		
3.38	98	2		
3.39			120	
3.40			108	Struggling.
3.42			116	Sighing resp.
3.43				Resp. failed rapidly to 6 per min. Gave all O for 1 min.; resp. regained immediately.
3.44			116	
3.46	80	20	84	Resp. fails.
3.47			80	Profound anesthesia.
3.49	96	4		Valve closed.
3.50	80	20		The effect of 80 and 20 N_2O and O was to render rat quite lively and wide awake. Walks about cage.
3.51				All N_2O. Rat seems to remain quite lively, but jar previous to 3.51 has been filled with O, which must be taken into consideration.
4.01	95	5	78	Activity stopped suddenly.
4.02	98	2	80	Valve closed.
4.05			120	
4.06				Valve closed.
4.08			100	
4.09				Valve opened. Stopped. Quivering of head.
4.10				Dead.

Rat 34. *August 5.*

Time.	N_2O.	O.	Resp.	Comment.
4.17	80	20		Valve closed.
4.23	90	10		
4.28	95	5		Still active, slight dragging of hind legs.
4.29			80	
4.30				All N_2O before beginning anesthetic. Six movements of bowels in 2 min.
4.34	96	4		Complete anesthesia.
4.35	95	5	60	
4.37			72	
4.38	92	8		
4.40			84	
4.42	98	2		Quite active; labored breathing comes suddenly.
4.45	95	5	92	
4.47			88	Valve opened.
4.48	94		6	This rat was anemic.

Time.	N_2O.	O.	Resp.	Comment.
4.51	98	2		
4.53				Struggling.
4.56	90	10	40	
4.59			84	
5.00	96	4		Profound anesthesia.
5.01	90	10	56	
5.03			64	
5.08				Moves about: becomes lively. All N_2O. Struggling.
5.10	80	20		Becomes quiet again.
5.12	97	3	84	
5.18				All gas. Valve closed.
5.21			60	
5.22	98	2		
5.25			64	
5.27			104	Valve opened.
5.33				Resp. failing.
5.39				Dead.

RAT 35. *August 6.*

Time.	N_2O.	O.	Resp.	Comment.
11.05	92	8		Valve closed.
11.08			120	Rat feels effect of gas.
11.10				Drags hind legs; no response to noise. Almost complete anesthesia. Cyanosis.
11.12				Resp. varying in 1 min.
11.14				Power of moving noticeable.
11.15			120	
11.16			88	Deep anesthesia. Resp. failing.
11.17				Valve opened.
11.18			72	About 3 resp. per min. Stops respiration while in this condition.
11.23			48	Valve opened. Response immediate.
11.24				Valve closed.
11.27			124	
11.29				Labored resp. Valve opened.
11.30			108	
11.31				Exhaust valve closed.
11.34	92	4		
11.35				Struggling.
11.36			64	
11.38				Clonic convulsions.
11.39				Stopped breathing suddenly.

RAT 36. *August 6.*

Time.	N_2O.	O.	Resp.	Comment.
11.55	92	8		Valve opened.
11.58				Beginning paralysis of hind legs. Tendency to turn around, as clock goes; entire right side dragging.
12.03			96	
12.04			112	Becomes quiet.
12.04½			16	Collapse follows. Valve opened; pure O for 1 min.
12.05			40	
12.06	90	10		
12.07			60	Valve closed.
12.09				Again conscious, moving about. So much O in jar renders it impossible for a few min. to regulate exact percentages of N_2O.
12.12			120	All N_2O. Valve opened. Signs of collapse.
12.13	50	50	64	Resp. goes to 80 in ½ min.
12.14	90	10		Picks up rapidly.
12.15	96	4		Struggling.
12.19			100	
12.24			120	Profound anesthesia.
12.26			32	Failing rapidly. Valve opened.
12.27	90	10	100	
12.32	96	4	120	Exhaust valve opened.
12.35	50	50	24	Convulsion.
12.36	96	4	76	
12.40			92	
12.44				Jar removed, inhaler applied directly to nose; tail cut and blood taken.
12.45	98	2	120	Coming to.
12.47				Rat dissected while in anesthesia, and blood taken.

RAT 37. *August 6.*

Time.	N_2O.	O.	Resp.	Comment.
1.09	90	10		Valve opened. (Escape opening of bell jar.)
1.16				Inability to move.
1.19			120	
1.20				No response to noise.
1.22				Exhaust valve closed.
1.25			68	

Time.	N_2O.	O.	Resp.	Comment.
1.27	97	3	72	Rat able to move about but not very much alive.
1.30			68	Still moves about.
1.33				All N_2O.
1.34	92	8		Responds slightly to noise.
1.38	95	5	64	Still active.
1.40				All N_2O.
1.44			108	Deep cyanosis.
1.45	92	8		Still crawls about cage.
1.48	96	4		
1.51				Anesthesia.
1.53	90	10		Spasms.
1.55	95	5	120	Sighing at times.
1.59				All N_2O. Resp. fails rapidly.
1.59–2	50	50		Under all N_2O. Resp. 6 per min.
2.00	90	10		
2.01	95	5		
2.04				Sob respiration.
2.05	90	10	44	
2.06	96	4	72	
2.09	98	2	88	
2.10				All N_2O. Struggling.
2.13	98	2		
2.13–2				All N_2O.
2.16				Struggling.
2.17	95	5		
2.18	98	2		
2.19				Gasping and struggling.
2.20				Dead.

Rat 38. *September 19.*

Time.	N_2O.	O.	Resp.	Comment.
2.58	85	15		
3.04				Feels effect. Moves hind legs with difficulty.
3.08			54	
3.09	90	10		
3.12			72	
3.15			92	
3.18			108	
3.19	95	5		
3.20				Cyanosis of nose.
3.21				Cyanosis of nose and ears quite marked.
3.22			120	
3.24				Cyanosis. Lying prone without moving.
3.27			81	
3.28				Will lift head on noise.
3.29				Will not move on tapping of jar.
3.30			54	
3.32			52	
3.35			52	
3.36				Moves head over to one side.
3.39			54	
3.40	98	2		Still moves head.
3.41				Gets up, walks around; drops again.
3.43			72	
3.46			88	Does not move.
3.50			96	Sample taken.
3.54				Gas runs out.
3.55				New gas tank put up and connected.
3.57			96	
3.59-3				Pure N_2O.
4.02				Turns over and moves about jar.
4.06			52	
4.07			28	
4.07 2			16	
4.12				Dead.

Rat 41. *September 10.*

Time.	N_2O.	O.	Resp.	Comment.
4.35	90	10		
4.45			100	
4.40				Pure N_2O.
4.50	95	5		
4.53			72	
4.54				Difficulty in moving hind legs.
4.55			68	
4.58				Analgesia.
5.05			96	
5.07			100	
5.10			130	
5.11				Complete anesthesia.
5.14	50	50	32	
5.15			80	
5.16	90	10		
5.17–2	95	5		
5.18			130	

Time.	N₂O.	O.	Resp.	Comment.
5.21			80	
5.23				Gets up, tries to walk around.
5.25				Pure N_2O.
5.32				Moving around.
5.34			120	
5.34–2	75	25	44	
5.35			48	
5.36	95	5		
5.38			92	
5.39				Pure N_2O.
5.41			51	
5.43			51	Cyanosis of nose, tail, and eyes.
5.45			54	
5.47			54	
5.54			108	
5.55				Died.

RAT 44. *September 16.*

Time.	N₂O.	O.	Resp.	Comment.
1.51	75	25		This rat was diseased.
1.55			46	
1.59	75	25		Died.

RAT 45. *September 16.*

Time.	N₂O.	O.	Resp.	Comment.
2.07	75	25		Inclosed bell jar. This rat was sick.
2.10			112	
2.12			114	
2.15			50	
2.17–2	50	50		No resp. Died.

RAT 46. *September 16.*

Time.	N₂O.	O.	Resp.	Comment.
2.35	75	25	112	Inclosed bell jar. This rat was diseased.
2.37			108	
2.38	50	50	86	
2.42	50	50	118	
2.43	85	15	150	
2.45	85	15	100	
2.46	85	15	106	
2.46–2	90	10		
2.47			86	All O at collapse.
2.48–2	85	15		
2.51	95	5		
2.53–2				Cyanosis.
2.54	95	5	120	
2.55–2	75	25	58	Near collapse.
2.57	92	8		
2.59	75	25		At collapse resp. stops.
3.00	50	50	60	All O; spasmodic resp.
3.01				All O.
3.02				Dead.

RAT 47. *September 16.*

Time.	N₂O.	O.	Resp.	Comment.
3.11	75	25	120	Inclosed bell jar. This rat was diseased.
3.14	75	25	100	
3.15	85	15		
3.17				Cyanosis of hind legs.
3.19	85	15	120	
3.19–2	92	8		
3.22	92	8		Slight paralysis of hind legs, but active.
3.23	92	8	100	
3.24	92	8	81	
3.24–2	50	50	102	
3.26	90	10		
3.27–2	90	10	88	
3.29	90	10		Moving about the jar.
3.30	90	10	25	
3.30–2			120	Pure O. Brought back.
3.31	75	25	120	
3.34	90	10	126	
3.35				Pure N_2O.
3.37			96	Pure N_2O has been given for 2 min.
3.38				Spasmodic conditions.
3.38–2			110	Collapse; pure O, back to normal in 1 min.
3.41			104	Pure N_2O.
3.45			104	Has taken pure N_2O 4 min. In good condition.
3.48				About to collapse.
3.50				Resp. normal on pure O; brought back in 2 min.
3.51				Pure N_2O. Condition normal.
3.52			90	Pure N_2O.
3.55			90	Pure N_2O. Still in good condition.
3.60				Dead.

RAT 48. *September 16.*

Time.	N_2O.	O.	Resp.	Comment.
4.07	80	20	76	This was a diseased and anemic rat.
4.10	50	50		Almost collapsing.
4.10–2			50	Pure O.
4.16–2			66	Pure O. Revived.
4.17	90	10		Walking about.
4.20	90	10	92	Has been under N_2O 90 for 3 min.
4.23	90	10	80	Spasmodic condition.
4.24–2				Pure O. Brought back.
4.27–2	90	10	54	
4.30	90	10	60	Gets up and walks about.
4.32	90	10	40	
4.32–2	90	10	56	Paralysis of hind legs.
4.34–2				Pure O. Spasmodic.
4.35			32	Pure O. Almost collapsed.
4.37				Pure N_2O.
4.41			50	Pure N_2O.
4.45				Dead.

RAT 49 (LARGE) AND 50 (SMALL). *September 16.*

4.50	75	25		
4.55			88	Large rat.
4.56			38	Small rat.
4.57–2			24	" "
4.57–2			20	Large rat.
4.58–2			28	Small rat.
4.58–2			16	Large rat.
4.59				Pure O.
4.59–2				Small rat died.
5.00			40	(Large rat.)
5.01	50	50		Revived to normal.
5.05	85	15	70	
5.06	95	5		Good anesthesia.
5.08			40	
5.08	25	75	62	
5.11	75	25	76	
5.12	90	10		
5.14			64	
5.15	50	50		
5.16				Dead.

RAT 51. *September 24.*

Time.	N_2O.	O.	Resp.	Comment.
10.32	90	10		
10.35	90	10	102	Paralysis of hind legs.
10.38	90	10	96	
10.40	50	50	86	
10.45	90	10		
10.47	80	20	68	Jactitation.
10.49				All O at pressure. Complete collapse. Resp. 16 per min.
10.52			84	All O.
10.52–2	85	15		
10.55	85	15	138	Brought back; moves about; paralysis of hind legs.
10.57–2	85	15	118	Breathing good.
11.00				Pure N_2O. Moves about.
11.05			104	Pure N_2O. Walks about.
11.06–2	90	10		
11.11	95	5		Walks awkwardly.
11.18–2	95	5	24	
11.21	95	5		Spasm of left hind legs and back part of body.
11.22				Dead.

RAT 53. *September 24.*

11.30				Pure N_2O.
11.32			96	Pure N_2O.
11.34				All oxygen. Death spasm.
11.35				Complete collapse in 5 min. Placed in bell jar and resuscitated.
11.38	50	50		Bell jar sealed at this point.
11.42	85	15		
11.45	95	5	96	
11.53	50	50		
12.00	50	50	98	
12.03	90	10	110	Spasmodic twitching of muscles (this noticed in 2 rats).
12.08				Pure O. Revived.
12.11	90	10		
12.14	95	5		
12.17–2	95	5	94	Twitching spells.
12.21				Pure N_2O.

Time.	N_2O.	O.	Resp.	Comment.
12.22			82	Pure N_2O.
12.27	90	10		
12.37	95	5	64	Had spasms.
12.42			12	Collapse of rat: spasmodic resp. Dead.

Rat 54. *September 24.*

Time.	N_2O.	O.	Resp.	Comment.
12.50	80	20		
12.58	95	5		
1.04				Pure O. Spasm or quivering. Death.

Rat 55. *September 24.*

Time.	N_2O.	O.	Resp.	Comment.
1.40	90	10	100	
1.41	50	50		
1.43	90	10		
1.45				Pure O.
1.46	90	10		
1.50			58	
1.52	85	15		
1.53			30	
1.54			28	Pure O.
1.55	85	15		
1.56			72	
2.00			120	
2.01	92	8		
2.07			118	
2.08				Pure N_2O.
2.10			130	
2.12			140	
2.15	50	50		
2.20				Removed from bell jar to be restored.
2.30	50	50		
2.40				Died.

Rat 57. *September 24.*

Time.	N_2O.	O.	Resp.	Comment.
3.00			130	Pure N_2O.
3.05			90	Pure O. Anesthetized.
3.07	50	50	141	
3.09	85	15	102	Recovered.
3.18	92	8	100	Partial paralysis of hind legs.
3.26	92	8	102	Complete anesthesia.
3.29			50	Pure O. Collapse.
3.30	85	15	50	Recovering.
3.40	90	10	80	
3.45	90	10	110	Anesthesia complete.
3.50	90	10		" "
3.55	90	10	84	" "
4.00	90	10	88	" "
4.05	90	10	80	Occasional gasp.
4.12	50	50	34	Weak; collapse.
4.15				Dead.

thesia was readily controlled, while such outside influences as fright and shock could be avoided.

Nitrous oxid and oxygen were delivered into the jar by one of the modern appliances for measuring and regulating the flow of the gas. At first a large amount of oxygen was given, 25 parts oxygen to 75 parts nitrous oxid, which was gradually reduced to 5 parts oxygen and 95 parts nitrous oxid. (The chamber in which the animal was anesthetized being large as compared with the respiratory requirements of the animal, satisfactory anesthesia was not readily produced by immediately using the latter mixture.) All the animals were kept in a narcosed condition for at least thirty minutes. An examination of the clinical records of the animals anesthetized shows that after the first collapse many of them developed a certain amount of immunity to large doses of nitrous oxid. A careful record was made of the physical changes produced in each animal under anesthesia; respirations were counted every five minutes, cyanotic conditions being noted, and the movements of the body were observed throughout the period of narcosis. (See series of experiments, pages 421–430.) The hind legs became paralyzed first, and weakness in the back muscles was observed some time before anesthesia was produced. At this stage the animal would respond to any loud sound by pulling itself about with the fore feet, absolutely no motion being made with the hind feet. The paralysis was followed by deep anesthesia, with the respirations running from 50 to 72 per minute; below 50 the drop in number of respirations became very rapid. The animals were often restored after the respirations had dropped to 6 or 10 per minute by using a large supply of oxygen and resorting to artificial means such as compressing the abdomen and holding the animal up by the tail. After anesthesia had been continued from thirty-five minutes to one hour the animal was removed from the anesthetic chamber, killed by quick decapitation, and sufficient blood secured to make a study both of the change in erythrocytes and leucocytes and of the hydrogen-ion concentration.

(See Table I.)

The erythrocytes and the leucocytes were counted by means of a Thoma-Zeiss pipet and counting chamber, and a differential study of the leucocytes was made using a double stain of methylene blue and eosin. The p H of the blood was determined by the method of Levy, Rowntree, and Marriott, and the R p H by the method of Marriott. The standard solutions of known hydrogen-ion concentration were checked by means of the hydrogen electrode or gas chain.

Chisolm* made a count of the erythrocytes in 50 rats, getting an average of 8.8 millions per cubic millimeter.

Rivas† reports a series of ten counts of erythrocytes in normal rats. The number of erythrocytes varies from 7.4 millions to 9.2 millions per cubic millimeter. He also reports a differential count of the leucocytes in the same animals.

In the present study a much greater variation was found in the erythrocytes, there being a difference of 4.8 millions per cubic millimeter between the highest and lowest counts in the 21 animals studied.

The erythrocytes were decreased in number after anesthetization with nitrous oxid and oxygen for thirty minutes to one hour, the maximum decrease in the 20 animals studied being 70 per cent., the minimum 1 per cent., with an average of 25 per cent. Macrocytes and microcytes were present in a few cases, but no poikilocytes or nucleated cells were observed. The ability of the erythrocytes to retain their stain was also found to be slightly lessened in a few of the animals.

(See Table II.)

The leucocytes did not show any change in actual number that was constant throughout the series of experiments, there being a decrease in number in 12 out of the 20 animals, and an increase in 8. A study of the different varieties of leucocytes, however, showed a marked tendency on the part of the polynuclear neutrophiles to decrease and of the lymphocytes to increase. Of the 20 animals studied, 18 gave a decrease in polynuclear neutrophiles, varying from 1 to 75 per cent., and 16 of the 20 animals gave an increase in lymphocytes varying from 5 to 23 per cent.

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* R. O. Chisolm, *Quarterly Journal of Experimental Physiology*, iv, 207–229 (1911).

† Quoted by Donaldson: "The Rat." Memoirs of the Wistar Institute, No. 6, pp. 40, 41, 1915.

A study of the transitionals and eosinophiles showed that there was no change of special interest, the decrease and increase being about equal throughout.

(*See Table III.*)

A study of the segmentation of the polynuclear neutrophiles also revealed little of interest, no constant change in either direction being observed.

(*See Table IV.*)

While both p H and R p H showed wide variations between their maximum and minimum values in both the normal and the anesthetized rats, careful scrutiny of the apparatus, the reagents, and the technique failed to reveal any reason for rejecting any of the results. Since the average value of p H is slightly less in the anesthetized rats than in the normal animals, the hydrogen-ion concentration was slightly greater in anesthesia than under normal conditions. As to R p H, it was numerically greater than 7—neutrality—in two-thirds of the normal rats, and in but one-third of the anesthetized rats, showing that the alkali reserve of the blood was depleted during anesthesia. This decrease in the alkali reserve was comparable to that of a mild acidosis in man.

The average R p H was 7.95 in normal rats and 7.60 in anesthetized rats, a difference of 0.35. Marriott's figures for R p H in man are—Normal adults 8.4 to 8.55, moderate degree of acidosis 8.0 to 8.3; the difference here would be between 0.1 and 0.55.

1831 CHESTNUT ST.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

A New Agent for Devitalization of the Pulp, and a New Method of Root-canal Filling.

By ENRIQUE A. BRUUN, L.D.S., Buenos Aires, Argentine Republic.

ON page 839 of the DENTAL COSMOS for July 1916 reference is made to a communication which appeared in the *British Journal of Dental Science,* issue of January 15, 1916, under the heading "Devitalization of the Pulp in Civil and Military Hospital Practice." Being the author of that communication, I believe it will be of interest to the profession to give the details in regard to the composition and employment of the so-called "salt of cobalt" mentioned, and the results to be obtained from its use.

Composition. The mixture consists of equal parts of metallic cobalt—chemically pure cobalt, without arsenic—and cocain hydrochlorid.*

Effects. The coagulation of the blood in the veins caused by the cobalt is rather a slow process, and the effect is never found in any case to go beyond the region of the apex. Against the vital granulation at this point, where the blood can circulate more freely, the cobalt seems to have no effect whatever. Again, where the cobalt touches the gum between the teeth, it does not, like arsenic, produce necrosis, and even where the cobalt has been left in the tooth for a month or more no harmful effects have resulted. When applied to the exposed pulp it produces no pain whatever. In cases where it may be desirable to devitalize the pulp of a tooth for bridge work, it may even be applied where a thick cover of dentin is still left. In cases of purulent pulpitis it can be placed without danger inside the root-canal, in connection with formalin tricresol.

I have used it a number of times in children's teeth, where the apex may be considerably open, and as it then may be rather difficult to obtain the effect in the region of the apex, I have in such cases used it in connection with caustic soda —NaOH, about 10 per cent. of which is added to the mixture. In ordinary cases it is used in connection with carbolic acid.

DIRECTIONS FOR EMPLOYING THE COBALT.

In the case of a molar or premolar affected by acute pulpitis, the fragile margins are first cut down, after which I clean out the cavity as far as possible without causing the patient any pain, and then the cobalt is applied in accordance with the directions given below. Should it cause too much pain, I either make a local anesthetic injection or apply the cobalt at once, without excavating. In the latter case I arrange for a sitting the next day, when the cavity may be cleaned thoroughly without causing the patient any pain, and the cobalt is again applied and left in the tooth for about a week, according to the indications given below.

If I make an injection, generally a regional one, the cavity and the pulp chamber in multi-radicular teeth are cleaned, the coronal portion of the pulp is removed, and the pulp chamber dried. I do not, however, remove any of the root pulps, although this could be done quite painlessly on account of the injection; the reason for this is explained farther on. I always prefer to remove the root pulps later, when they have become mummified by the effect of the cobalt.

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* Chemically pure cobalt is rather difficult to obtain, but in any case it may be procured from Messrs. A. Koelliker & Co., Zurich, Switzerland, who manufacture it for use in experiments in connection with the devitalization of malignant tumors.

A small ball of cotton is now formed, the size varying, according to the different cases, from the size of a grain of wheat to that of a small pea. This ball of cotton is saturated with carbolic acid, dipped into the black cobalt powder, and placed at the bottom of the pulp chamber on the exposed pulp.

The cavity is then filled with a cement made in the following manner: Zinc oxid—pure, without arsenic—and eugenol are mixed into a paste of a thick consistence. This paste is rubbed into a small piece of cotton and then placed in the cavity as a temporary covering.

As soon as one becomes accustomed to the use of this kind of "temporary stopping" he will learn to appreciate its merits as a substitute for the ordinary gutta-percha or "Fletcher" fillings. The stopping closes the tooth hermetically, and of course it may also be used as a cover for other medicaments, formalin tricresol, for instance, and it quickly becomes so hard that even if the tooth be used for masticating, the effect can hardly be noticed even if the stopping be left in for months. As soon as the tooth is filled, the patient can be allowed to leave, as the saliva only has a hardening influence on this kind of stopping.

As it contains cotton, it forces the gum away on account of its elasticity when pushed into a cavity, and when removed it leaves the marginal ridge exposed to sight. Due to its disinfecting properties, it also leaves the mucous membrane intact, and a supergingival cavity can later be prepared without causing any bleeding of the gum. Even in cases where the decay or fracture of the root has proceeded as far as 4–6 mm. below the gum, the latter may easily be pushed aside by this stopping before the preparation of the root, and the root later prepared and built up with amalgam for putting on a crown, without any bleeding being caused thereby.

Besides, there are other advantages connected with the use of this "zinc-oxid-eugenol cement," which will be mentioned later on.

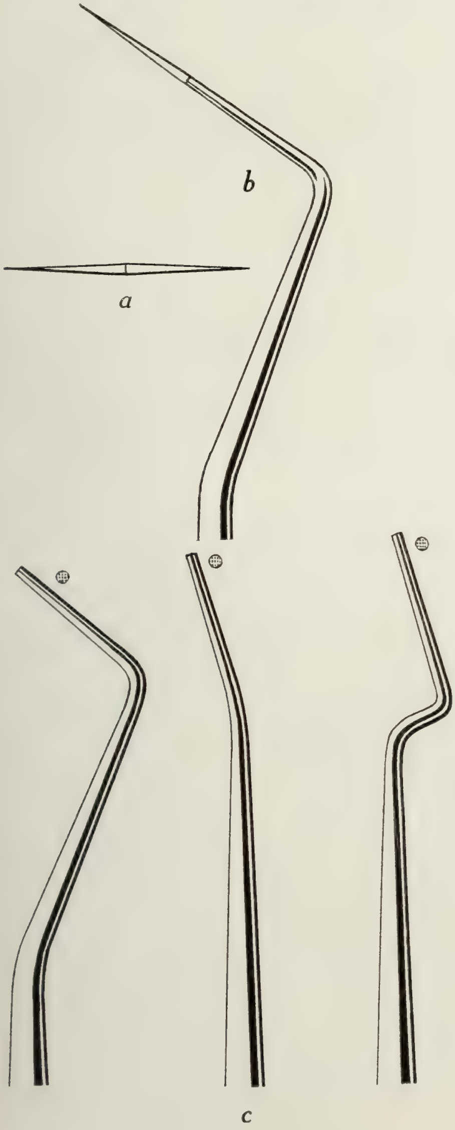
The cobalt is generally left covered with this cement for about a week. In several cases it has, however, been left in for a much longer time, in some instances even up to three months, and still I have been unable to notice any harmful effect when the tooth has been uncovered.

The above directions apply, as mentioned, only to multi-radicular teeth. For the front teeth I never use the cobalt, not only because it almost invariably discolors the tooth, but also because it is rather easy to remove the pulp in these teeth completely by other methods, as by a local injection or by pressure anesthesia. In the multi-radicular teeth it is, however, not always an easy matter to remove the pulp completely when an injection has been made. A small part of the pulp is very likely to be left, and when this becomes inflamed, as a *locus minoris resistentiæ*, a chronic periosteitis may result. In my opinion, it is therefore far better to leave the pulp tissue to be mummified by the action of the cobalt. I have employed this procedure now for more than four years, in hundreds of cases, and have never experienced any trouble whatever in connection therewith.

When the cavity is uncovered, after the cement has been left in, as mentioned, for at least a week, the pulp can generally be removed quite painlessly. Sometimes, however, with very nervous persons, some pain may still be felt. In such cases the pulp chamber is filled with carbolic acid, and through the acid a fine Donaldson needle, without barbs, is introduced and passed down along the inner wall of the root-canal between the pulp and the dentin. The needle is then quickly withdrawn, when the outer atmospheric pressure will force the carbolic acid down into the cavity produced by the needle. The removal of the pulp can then be carried out without any inconvenience to the patient.

ZINC-OXID-EUGENOL PASTE AS A ROOT-FILLING.

When the root-canal is properly cleaned and enlarged, first with Kerr's broaches and later with a Gates-Glidden drill, and dried out, the writer employs the following method for filling the canal:



Three parts of beeswax and three parts of lanolin are melted together with one part of thymol and one part of eugenol. This will form a thick paste, and a little of this is placed on a spatula, dipped into a 40 per cent. solution of formalin, then mixed well together on a slab with zinc oxid until a very thick paste is produced. From this paste rolls are formed into the shape shown in the figure at *a*. A roll is divided into two equal parts, and one of them is placed on the end of the canal plugger, as shown at *b*, introduced into the enlarged and cleaned root-canal, and pushed down until it fills the canal completely. A small ball of Hill's stopping is put on top of this, and the filling is pushed down until the patient feels a slight pain—the proof that the filling has reached the apex.

This paste gets very hard. I have found it quite unchanged after it had been left in for two years, and without any odor whatever.

In the figure at *c* I have shown a few of the most convenient shapes of canal pluggers which I use for this method of root-canal filling.

OTHER USES OF THE ZINC-OXID-EUGENOL PASTE.

Finally, I may mention some other uses of the zinc-oxid-eugenol paste.

This paste may be used with very good results for filling children's teeth. The preparation is as mentioned above, only instead of mixing the paste with cotton, asbestos fibers are used. The filling may be left in for three or four years.

In cases where it is difficult to see whether the pulp has been exposed or not, especially in young teeth, I cover the cavity with this paste, and leave it in for three or four months. If the patient suffers any pain from this treatment, the pulp must of course be removed; but generally the result is that the pulp contracts, and afterward the cavity may be filled without the pulp having been removed. I leave a little of the paste in the part of the cavity nearest to the pulp.

In the case of a badly decayed first permanent molar, where the decay has nearly reached the pulp, and where it may be very difficult to excavate the cavity without exposing the pulp, I fill the cavity with the paste, and let it harden under the saliva until the next sitting. Then the uppermost part of the paste is removed—the lower part, where the decay is nearest to the pulp, being left in—and finally the cavity is filled with amalgam.

I may later, in another article, mention how this paste is used in connection with inlays.

I trust that the above hints in regard to the use of the cobalt and the zinc-oxid-eugenol paste may prove to be of value to the profession. I feel confident that anyone on trying them out in practice will find that I have not in any respect overrated their merits. As for myself, I can only say that the use of these two medicaments has contributed in no slight degree toward making the practice of dentistry agreeable, by eliminating the perpetual complaints of pain as caused by the use of arsenic, and eliminating the usual terrible stories about "nerve" removing, etc.

A Study of the Lymphatic Vessels of the Dental Pulp.

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AND

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THE dental pulp is one of the tissues in which the existence or non-existence of true lymph vessels has been for a long time the subject of constant debate. The general tendency was to consider that the pulp was deprived of lymphatics, and it is only in the latest editions of some text-books on anatomy that the presence of lymphatics is admitted—this being in recognition of Schweitzer's reports of successful injections in 1907 and 1909. Affirmative statements have appeared from time to time, but they were made from deductions for the most part, or merely on hypothetical bases.

A chronological review of the earlier opinions regarding the problematic lymph vessels of the pulp is contained in Körner's[*] publication of 1897. The earliest dates from 1796, which ascribes nerves, bloodvessels, and "probably also absorbing vessels" to the dental pulp. In 1897–98 the results of the first attempts to inject the lymph vessels of the pulp were reported; all had failed, and it is not surprising that the most emphatic denial of the existence of such vessels comes from these investigators. Thus Körner writes: "Preformed lymph spaces, lymph capillaries, or lymph vessels do not exist in the living tooth pulp. Absorption evidently occurs by means of the intercellular fluid current in the tissue." Ollendorf[*] states: "It seems certain to me that Körner's view is correct, that lymph capillaries and lymph vessels do not exist within the pulp," and he disputes this author's contention that the pulp may resorb in spite of the lack of lymph vessels.

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[*] "Ueber die Beziehungen der Erkrankungen der Zähne zu den chronischen Schwellungen der regionären Drüsen." Berlin, 1897.

[*] "Ueber den Zusammenhang der Schwellungen der regionären Lymphdrüsen zu den Erkrankungen der Zähne," *Monatsschr. f. Zahnheilk.*, 1898, 16, p. 249.

In Stahr* we read: "Ollendorf's work assumes special interest on account of the negative results. Together with Ollendorf, I have taken the utmost pains to inject lymph vessels from the tooth pulp in young and adult bodies, and Ollendorf has utilized in this work all the technical means of odontologists. For practical purposes it would be exceedingly desirable to demonstrate what relations the different teeth have to different lymph glands. However, if our efforts in this direction have been without result, we might make, with precaution, a contribution to the yet debatable question whether there are lymph vessels in the pulp—namely, that at any rate they cannot be injected—which is an important item for experienced injectors."

After these unsuccessful experiments, evidently no attempts were made until 1907, when Schweitzer,† upon the advice of Bartels, an expert in such work, undertook to inject the lymph vessels of the pulp by a different method. He obtained positive results, although only in a few cases, and was thus the first to demonstrate the presence of lymph vessels in the pulp. Referring to this work, Bartels‡ makes the remark that "In this he has performed a lasting service in the field of anatomy. He has succeeded in taking a fortress which had been considered impregnable." Testut§ in the latest edition of his text-book on anatomy, expresses frank recognition of Schweitzer's work, stating that "This author has clearly demonstrated the presence of true lymph channels in the dental pulp." Poirier and Charpy,* in a peculiar self-contradiction, it would seem, state that "The presence of lymph vessels in the dental pulp has not yet been demonstrated. . . . Schweitzer, on the contrary, has succeeded in injecting, in the dog and the monkey, vessels at the level of the pulp which have all the characteristics of lymph vessels . . . but their ultimate pathway is rather poorly defined, and one cannot accept unreservedly Schweitzer's conclusions when he describes them as tributaries of the submaxillary and the deep cervical lymph glands."

EARLY EFFORTS TO DETERMINE THE PRESENCE OF LYMPH VESSELS IN THE DENTAL PULP.

The earliest attempts to discover lymph vessels in the tooth pulp were made by testing as to whether the pulp is possessed of any resorptive power. The first was Carreras, who placed chemical substances such as potassium iodid, iodoform, mercuric chlorid, sodium salicylate, and strychnin nitrate on the dental pulp of rabbits and dogs, and tried to demonstrate their presence by chemical analysis of the urine, without ever finding any noteworthy reaction. From this he concludes that there is no indication of any true lymph vessels in the pulp. Körner placed finely divided insoluble Prussian blue and cinnabar upon the pulps of dogs anesthetized with chloroform. The dogs were killed after two and three days. Single particles of the coloring matter were found in the pulp in very minute quantities as far as the root-apex, and also in exceedingly small quantities within the glands. He could not, however, demonstrate that the coloring matter was conveyed through preformed lymph spaces. He concludes from this that, if the pulp has no lymph vessels, it has, nevertheless, the power of resorption. This proof of the resorptive power of the pulp is recognized by Testut and by Poirier and Charpy. Körner's attempts to demonstrate true preformed lymph vessels by injections all failed. He injected Prussian blue into the pulps of freshly extracted human teeth, as well the pulps of calves' teeth, but he regarded all the vessels which he succeeded in injecting as bloodvessels.

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* "Die Zahl u. Lage d. submaxillaren u. submentalen Lymphdrüsen vom topographischen u. allgemeinen anatomischen Standpunkte," *Arch. f. Anat. u. Entwickl.*, 1898, p. 445.

† "Ueber die Lymphgefässe des Zahnfleisches u. der Zähne beim Menschen u. bei Säugetieren," *Arch. f. mikrosk. Anat. u. Entwickl.*, 1907, 69, p. 807; 1909, 74, p. 927.

‡ "Das Lymphgefäss-system," Jena, 1909.

§ "Traité d'Anatomie humaine," 1912, 4, p. 58.

* "Traité d'Anatomie humaine," 1911, 2, p. 1294.

Ollendorf, who worked with Stahr, reports absolutely negative results from his attempts to inject the pulp with Prussian blue. He worked on dead bodies, using as healthy teeth as possible. After negative results, when slight or no pressure was used, he repeated the experiment by making injections under great pressure—always with negative results. He believes that lymph vessels do not exist, and that consequently there can be no resorption by the pulp. He considers Körner's conclusions not justified, the coloring particles having possibly been taken up by the blood, from which they were conveyed to the lymph vessels. He repeated his experiments on two dogs without result.

Schweitzer adopted an entirely different method. He assumed that the lymph vessels of the pulp, if such exist, probably communicate by anastomosis with those of the peridental tissue, analogous to the communications between bloodvessels of these tissues. Therefore, by injecting the lymph vessels of the gingiva near the teeth, it could be expected that under favorable conditions one might force the fluid from these into the lymphatics of the pulp, regardless of a flow in a retrograde direction. In this way Schweitzer actually succeeded in filling lymph vessels in the pulp in some cases. He also studied the course which they pursue on thick sections through the entire tissues of the jaw, and he believes that he could trace them to the submaxillary and the deep cervical glands.

The comparatively recent date of Schweitzer's work may explain the curious fact that it is practically unknown in this country, and that the conception still prevails that the tooth pulp has no lymph vessels. Such being the case, and considering the fact that this is still the only conclusive evidence we possess, it seemed to us worth while to undertake experimental work in the same line of investigation.

We deemed it advisable to repeat the several methods of injecting the lymph vessels of the pulp as they were used by previous investigators. Schweitzer's method had the obvious recommendation of having been successful. Those of Körner, Ollendorf, and Stahr, although having given entirely negative results, nevertheless seemed alluring for the reason that the injection was made directly into the pulp. If by chance or some happy modification they could be made successful and the injection of the lymph glands be uncomplicated, there would be an immediate and unequivocal proof of lymph vessels in the pulp.

METHOD OF INVESTIGATION FOLLOWED BY PRESENT AUTHORS.

Our work was done chiefly on dogs. In all instances the bloodvessels were injected with carmine gelatin in order to eliminate any confusion as to whether the channels were lymph vessels, or arteries and veins. After ligation of the superior vena cava and the arch of the aorta in two places and opening the jugular vein, or the vena cava, the cannula was inserted into the left common carotid. The vessels were thoroughly washed out with physiological salt solution and the carmine gelatin mass injected. The body was cooled off under running water for from five to ten minutes. Before beginning with the injection of the lymph vessels, some time was allowed to pass, to insure the complete solidification of the gelatin. The head was severed, the fur removed, and the head warmed in warm water. We used the injecting mass which is now most frequently employed, *i.e.* the Gerota mass. For this, 2 gm. Prussian blue (oil color in tubes) is stirred with 3 gm. turpentine oil in a glass mortar for five minutes, 15 gm. of sulfuric ether is added, and this fluid is filtered through flannel or chamois skin. Most German workers recommend the use of finely drawn-out glass cannulas for the injection of lymph vessels; Schweitzer also worked with these. We used ordinary fine steel needles with Luer's syringe. The great fragility of the glass cannula makes it extremely difficult to keep the injecting point as near the deep portions of the teeth as we wished to do, and the flexible fine steel needle seemed to us better for injections in this region of the body. While injecting, slight pressure was made with the finger over the place of the inserted needle, and after withdrawing the latter, even, gentle massage was continued for some time. All excess of the fluid on the external surface was carefully washed off (most of the stain on the hands is also best removed by soap and water; turpentine oil should only be used to get rid of the last traces). The head was then left on the table for an hour or longer, and thereupon placed in 20 per cent. formalin. After twenty-four hours, or any later period, the injected teeth were singly sawed out from the jaw, carefully opened, and the pulps removed and examined. A limited number of dogs were treated in this way. In most of them, only microscopically short vessels were found here and there which were filled with the blue mass. In only one dog three pulps were obtained (from the upper canine and the lower incisor and first molar) which to the naked eye presented well-injected lymph vessels. They are very distinct if examined with the hand glass, and extend throughout the length of the pulp. On microscopic examination, well-injected perivascular lymph vessels were found in some sections and independent vessels in others. (See Figs. 1, 2, and 3.)

STUDIES OF PULPS INJECTED BY DIRECT METHOD.

A large number of dogs were injected by the direct method of Körner, Stahr, and Ollendorf, *i.e.* injecting Prussian blue directly into the pulp. There were several difficulties to be overcome. The dental pulp is inclosed within unyielding calcified walls. The bloodvessels filled with a gelatin mass, are expanded to their utmost capacity, necessarily constricting the lymph vessels and thus increasing the resistance of the tissue to the entering mass. Because the individual injection of a number of teeth consumes considerable time, that of the bloodvessels was made first. A hole was made in the tooth, reaching down to the pulp, and a metal cannula, made for this purpose, was inserted. Injections were also made with Luer's syringe and a steel needle, the point of which had been filed off to the base of the needle. Both the metal cannula and the syringe barrel were filled with a few cubic centimeters of Prussian blue by means of a medicine-dropper. Pressure was exerted in the syringe with the piston over a column of air, in the metal cannula, through a pressure tank or by blowing with the mouth for longer or shorter periods into paper cones the tapered ends of which were inserted into the cannula. Unless the needle or the cannula fits absolutely into the hole the fluid invariably flows back, at even very slight pressure. Special cannulas were made with a conical point to fit tightly in a hole made by a drill with a special thread; with these there was no backward flow. In using the pressure tank, jerky movements produced by compressing the rubber tube in quick succession seemed to be more effective than an even pressure.

Successful injections were made by one or the other of these methods, and often the negative results could not be better accounted for than the positive ones. The net result was that, in a few dogs, pulps were obtained which presented well-injected lymph vessels. In only one case were masses of the Prussian blue found in a submaxillary lymph gland; this occurred in a very young dog with milk teeth. Finally, the order of procedure was reversed, and the injection of Prussian blue was made before the bloodvessels were filled and distended with carmine gelatin, as it was evidently this condition which rendered the tissue so unduly resistant. The heads and necks of freshly killed dogs were kept warm by constantly applying hot wet cloths to them. Pressure was again effected by blowing or by the air-tank so applied as to bring about the above-mentioned jerky movements. The injection of the bloodvessels followed some time later. The results obtained with these proceedings, although applied only on a few dogs, were positive in every case, and far superior to any of the previous ones. The blue injection mass had filled lymph vessels emerging from the maxilla and the mandible and passed in considerable quantities into the submaxillary lymph glands and the deep cervical glands.

Our investigation of the exact course of the lymphatics from the dental pulp through the bony portions of the jaws has not yet been completed, as the best specimens of dogs' heads have been kept intact for demonstration. A report of this portion of our study will be made later.

There is every evidence to support the correctness of Schweitzer's statement that in the upper jaw the lymphatics leaving the dental pulps course within the bony portion of the maxilla and emerge through the infraorbital and other foramina into the subcutaneous tissue; those of the lower jaw enter the inferior dental canal, where they run along with the bloodvessels and nerves, and thence pass into the subcutaneous tissue. From either jaw lymph vessels enter the submaxillary and deep cervical glands.

Supplementary studies of the lymphatics of the pulp were made in an entirely different manner of investigation. From previous studies by one of us with trypan blue in connection with cholesterol, the striking observation was recalled that the lymph vessels of the mesentery as well as the regional lymph glands always were stained deeply blue, and the latter presented designs on the outer surface which seemed to indicate that the histological elements of the lymph sinuses had taken the vital stain. With this point in view a large number of rabbits and also a few dogs and cats were injected intravenously or intraperitoneally with trypan blue or lithium carmine for various periods of time. In these, the bloodvessels of the head were well injected with carmine or Berlin-blue gelatin, after which pieces from the various organs and the heads were placed in 10 per cent. formalin. When hardened, the pulps of the incisors, the brain and dura, tongue, and lymph glands were removed, and frozen sections were made from all these tissues. The minute cell structures were studied in thin sections. The main object, however, was to get a picture of the course and general arrangement of the vitally stained structures and elements, and for this purpose sections of an average thickness of 200 microns were made. The dura and pia were carefully removed *in toto,* cut into smaller portions with the scissors, and spread on glass slides. The same procedure was followed with the chorioid plexus, only in the dog and cat the normal thickness of the plexus was reduced by the freezing microtome. The presence of the gelatin in the bloodvessels secured a firm adherence of the unstained sections to the slides, so that they could be treated like paraffin sections. They were dried in the air, dehydrated in alcohol, cleared in xylol, and mounted in balsam.

The cells in the connective tissue which take the vital stain have been studied by various writers in regard to their behavior toward the stain, to their form, their function, and their occurrence. With some disagreement as to their true nature, they have been classed as endothelial cells, reticulum cells, wandering cells, "clasmatocytes," rhagiocrines, histiocytes, macrophages. All authors agree that the endothelial cells lining the peripheral vessels are not vitally stained, although Kiyono* reports that when the injections have been pushed far, single vitally stained cells may be found in the aorta and the thoracic duct. On the other hand, endothelial cells lining the blood capillaries in the liver, bone marrow, and spleen, and the sinuses of hemo- and lymph glands, are all vitally stained. In other organs or tissues, the endothelial cells of the blood capillaries do not take the stain.

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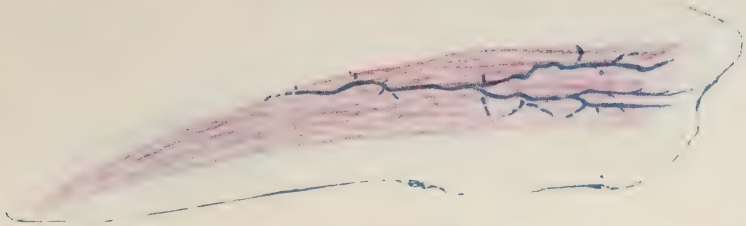
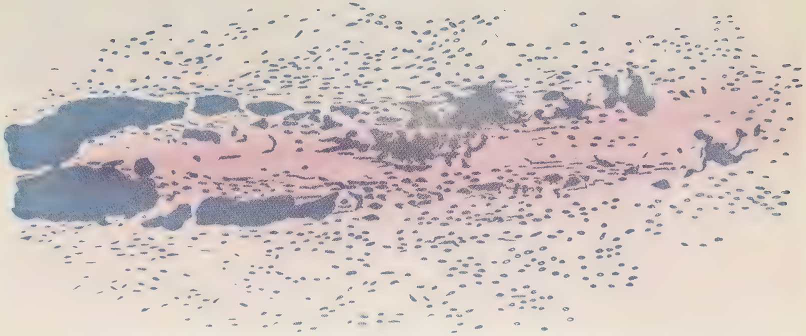
* "Die vitale Karminspeicherung." Fischer, 1914.

Fig. 1.



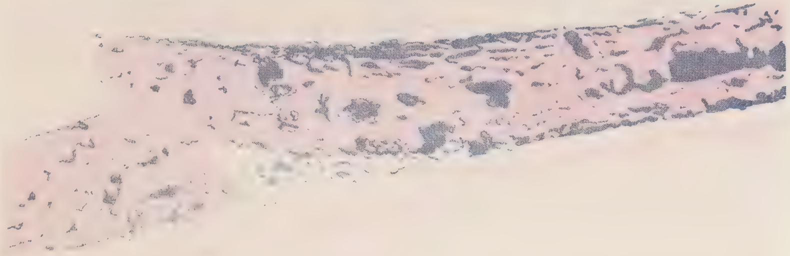
From a dog with temporary teeth. Pulp of a canine, lying within the opened tooth shell. Lymph vessels filled with Prussian blue by injection directly into the pulp.

Fig. 3.



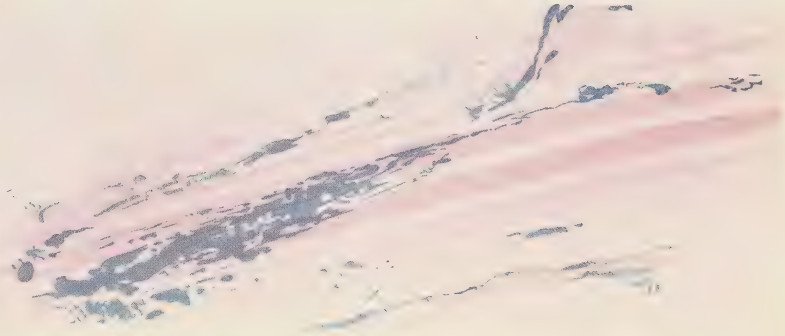
From the same dog. Perivascular lymph sheath.

Fig. 2.



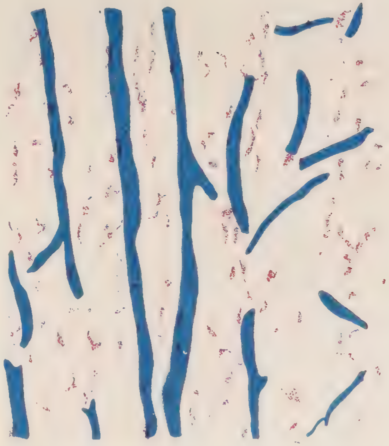
From a young dog. Frozen section from the pulp of a canine. Perivascular lymph sheath. Injection of Prussian blue into the tissues outside the tooth.

Fig. 4.



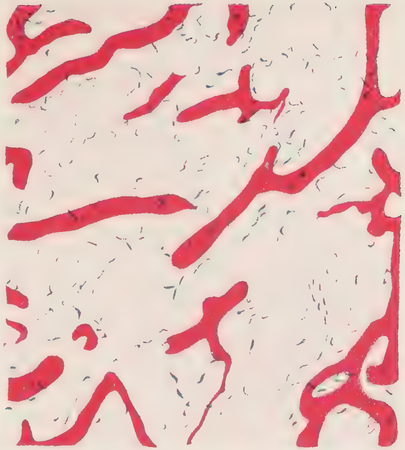
From the pulp of an incisor. Injection by the same method.

FIG. 5.



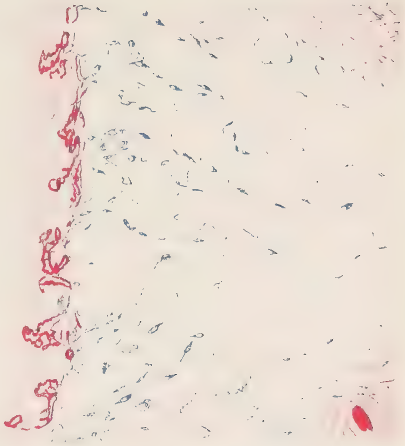
Frozen section from the dental pulp of a rabbit injected with lithium carmine. Bloodvessels injected with Berlin blue gelatin.

FIG. 6.



From the mesial extremity of the dental pulp of a rabbit injected with trypan blue. Bloodvessels injected with carmine gelatin.

FIG. 7.



From the tongue of a rabbit injected with trypan blue. Triangular area of connective tissue in the median septum.

KUPPFER'S CELLS.

The very active part which the Kupfer cells play in vital staining is well known. Their exact nature can as yet hardly be considered as well established. Although there is an overwhelming tendency to regard them as endothelial cells lining the liver capillaries, there are several writers who consider them as perivascular endothelial cells—as Kuppfer originally did himself. Disse* in 1890 reported the successful injection of perivascular lymph spaces of the liver capillaries by injecting into the adventitia of a large vein, and he described the Kupfer cells as belonging to these perivascular lymph channels. Browicz† in the same year asserted that they are "not integral constitutents of the capillary wall." In later years, Fraenkel, Ebner, and Reincke considered them as possibly belonging to the lymph channels. Still more recently, Schilling among others states that the exact location of the Kuppfer cells is by no means clearly established. Kiyono in 1914 admitted the possibility that Kuppfer cells laden with particles of injected India ink may pass into the tissue spaces and make their way into Glisson's capsule, and that dye particles eliminated from overladen Kuppfer cells may enter the perivascular lymph spaces and pass into the tissue of the fibrous capsule. However, whether these Kuppfer cells belong to the blood capillaries or their perivascular lymph sheaths, it is significant that vitally stained endothelial cells belonging to the vascular, hemo-, or lymph system have hitherto only been found in a few organs and glands, and that in these the blood and lymph elements are in the closest correlation.

STUDY OF THE VARIOUS CONNECTIVE TISSUE CELLS THAT BECOME STAINED.

From the literature on vital stains it becomes more and more evident that the special cells which take up the vital stains do not display a simple phagocytic function in this reaction, and cannot be identified with the phagocytes, although some of them are phagocytic at the same time. The typical phagocytes, the polymorpho-nuclear leucocytes, are not vitally stained, while cells otherwise not phagocytic are intensely stained. The stained granules which are found in all of these vitally stained cells are not colored particles precipitated out from the solution, but are constituents of the cells, organo-granules as they are called, which are stained with the dye and thus made conspicuous. By proper treatment the stain can be made to leave the granules, which again become colorless. Vital staining seems to be associated with some secretory function such as in the tubular epithelium of the kidney and the epithelium of the chorioid plexus. Evans* calls attention to the striking observation that, while the endothelial cells lining the sinuses and lymph channels within the lymph glands are intensely stained, there is an abrupt cessation of such staining of endothelial cells in the lymph vessels as they leave or enter the gland. This clearly indicates that the function on the part of the endothelial cells of the collecting lymph apparatus within the gland differs from that of the conducting apparatus outside of the organ. Very definite statements about such endothelial cells lining the lymph channels are made by Brass,† who found that as early as two hours after intravenous injections of carmine, red granules can be demonstrated in the cells lining the lymph vessels in the glands. He believes that the dye passes from the bloodvessels into the lymph, which circulating through the lymph glands delivers it to the endothelial cells.

Besides these cells, admittedly endothelial in nature, others within the connective tissue have been described as taking up the vital stain, and have been

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[*] "Ueber die Lymphbahnen der Säugetierleber," *Arch. f. mikrosk. Anat.*, 1890, 36, p. 203.

[†] "Ueber intravasculäre Zellen in den Blutkapillaren der Leberacini," *Arch. f. mikrosk. Anat.*, 1900, 55, p. 420.

[*] "The Macrophages of Mammals," *Amer. Journ. of Phys.*, 1915, 37, p. 242.

[†] "Ueber physiologische Pigmentablagerung in den Kapillarendothelien des Knochenmarks," *Arch. f. mikrosk. Anat.*, 1913, 82, p. 61.

identified with Ranvier's clasmatocytes, Maximow's resting wandering cells, Marchand's adventitia cells, Renaut's rhagiocrines, Goldmann's pyrrhol cells, Aschoff's histiocytes, Evans' macrophages. The presence of such cells within the connective tissue, commonly looked upon as simply a supporting stroma, with functions apparently in most intimate correlation to this tissue, seems to impart to it a particular value. According to Renaut,* the connective tissue is like "the largest of the glands with an internal secretion which exist in the body of vertebrates, because it keeps the elements ready for immediate action or susceptible to such action at any time, wherever bloodvessels course through the connective tissue." It must be to all observers a striking feature that only some of the cells within this tissue are stained. Brass writes: "The connective tissue is of particular interest in that its cells regularly take up the carmine only in part, while others—and on an average, most of them—remain free from it." Mention of such cells in definite locations is frequently made in the literature, and it is scarcely an accidental coincidence that these are the localities where lymphatics are known to exist.

Thus Goldmann reports that "pyrrhol cells" are present in the serosa of the digestive tract, where they are very numerous and "continuous." The number of cells is great in the submucosa, where they are often located about the perivascular sheaths. Referring to the adrenal, he writes: "The fibrous capsule is exceedingly rich in 'pyrrhol cells' in the entire periphery of the capsule, and also in the septum-like connective tissue tracts. . . . Those cells in the medulla which take the vital stain bear the complete characteristics of interstitial structures of the appearance of 'pyrrhol cells,' and are found mostly in the company of the bloodvessels."

Kiyono corroborates this statement: "Outside of the vessels of the medulla, but close to the vessel wall, there are sometimes vividly stained cells with two and three processes, morphologically like the reticulum cells of the bone marrow, the spleen, and the adventitia cells of the connective tissue."

The cells are present in the skin and submucosa, and in reference to them Goldmann remarks: "There is no direct connection of the connective tissue fibers with the protoplasm of these cells." This author also found that during lactation the number of "pyrrhol cells" in the interstitial tissue increases extraordinarily. In the heart and muscles they are found only in the intermuscular connective tissue. It is very significant," he writes, "that in the specialized muscle (heart and tongue) there are such great numbers of cells of this kind." The peripheral nerve trunks have "pyrrhol cells" in the endoneurium down to the finest cutaneous branches. In bones they are interlamellary, and they are mainly found in the Haversian canals, where "they seem to join the bloodvessels." There are many vitally stained cells in the adventitia of large vessels. In the lung such cells encircle the bronchial vessels seemingly in a continuous stream. They lie close to the vessel wall without penetrating it. They are also everywhere in the inter-alveolar septa. According to Kiyono they are also "in the lymph spaces of the interstitial tissue" of the lung, and Bouffard* found trypan blue granules in interstitial cells of the portal spaces. Without going farther with our quotations, it becomes very evident that all these are the identical locations within the connective tissue in which the presence of lymph vessels is known from injections.

SUMMARY OF THE AUTHORS' FINDINGS.

All our observations from numerous vitally stained animals agree entirely with the statements of authors about these cells and their minute structure, as in general also with those about other vitally stained elements which do not concern us here. The striking feature about these peculiar cells of the connective tissue is the constancy with which they occur in the same location, and the regularity in their relation to other structures which occur in the same region, such as bloodvessels. Another peculiarity is especially borne out by thick sections from rabbits which have been injected for a considerable length of time, and in which the cells are therefore greatly enlarged and have long processes filled with stained granules. Here a definite distribution, often in long-continued tracts, is evident, indicating a systematic arrangement. These tracts may be seen to divide into branches, clearly following directions independent of that of the connective tissue stroma. This is beautifully illustrated in thick cross sections of the tongues of rabbits which have been well saturated with trypan blue or carmine. The long granular processes of the large cells, running in the same direction, almost touch one another, thus forming well-defined lines.

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* "Les Cellules connectives rhagiocrines," *Arch. d'Anat. microsc.*, 1907, 9, p. 495.

* "Injections des Couleurs de Benzidine aux Animaux," *Ann. de l'Institut Pasteur*, 1916, 20, p. 539.

In the median septum of the tongue they diverge almost symmetrically from the middle and curve outward toward the periphery. Sections from the dental pulp are equally suitable for demonstration of the systematic arrangements of the vitally stained cells in the connective tissue. They are present in abundance. On account of the simplicity and uniformity of the structure as a whole, and the complete discoloration of other elements, they are always exceedingly distinct; the very rich supply of bloodvessels is, as a rule, very well injected with the gelatin carmine mass and forms the landmark in these sections. Continued tracts of vitally stained cells accompany most of these vessels. Occasionally it may be seen that the injection of the gelatin has caused a displacement of the bloodvessel; it bulges out or forms a loop, and the perivascular cell tract follows these displacements. Besides these perivascular tracts there are independent ones, and in these the branching-off in other directions is particularly interesting. Not so rarely it is quite apparent that two lines in close touch run parallel and send off branches here and there. In this connection a statement by Körner is of interest. "It is true," he writes, "that in the pulp there are no real connective tissue bundles the spaces of which represent the radicles of lymph vessels; the connective tissue fibrils rather run apparently in wild disorder, and are arranged parallel only in those places where they envelop vessels and nerves. But this strange arrangement can, of course, not hinder the passage of plasma from the smallest vessels or the capillary network into the tissue and the conveyance of the plasma to the nearest lymph vessel, *i.e.* it cannot hinder a regular lymph stream."

Toward the occlusal and at the periphery of the pulp the cells are very abundant; in the latter locality they are characterized, as a rule, by their large size, and a definite arrangement here is not so apparent. If we were to conceive of these vitally stained cells as being endothelial cells lining lymph channels, we should admit a rich supply of these in the pulp, consisting of perivascular as well as independent lymph vessels, fairly evenly distributed within the main part, denser at the periphery and plexus, as at the mesial extremity. Until additional evidences are furnished, we can merely suggest the possibility that the vitally stained cells denote the existence and the site of lymph vessels in this as well as in other organs. On the basis of repeatedly made statements that vitally stained endothelial cells line the lymphatics, lymph sinuses, and lymph spaces in lymph glands, and in the lung, and that the staining solution is carried along with the lymph, we repeat that it is permissible to presume that in other organs in which the same lymph circulates, the endothelial cells of the lymph channels would show a similar behavior toward vital stains. Granting this, we would naturally look for them in all those parts of the tissue in which lymphatics are known to exist—namely, in the interstitial and connective tissue.

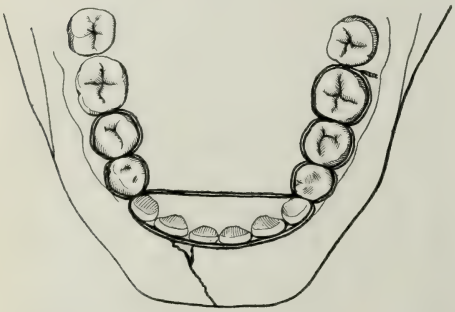
If our suggestion in regard to the vitally stained cells within the connective tissue should prove to be true, we should have a most valuable and exceedingly simple method of demonstrating not merely the presence but also the distribution and full extent of lymph vessels within organs.

The Wiring of Jaw Fractures.

By NORMAN S. ESSIG, D.D.S., Philadelphia, Pa.

In view of the great number of face wounds which have resulted from trench fighting and other phases developed by the great European war, the writer feels that any departure from the beaten path, even though it is of advantage to but a few, should be placed in the hands of surgeons who are at the present time doing such wonderful work in the different hospitals in Europe.

Fig. 1.



There is no claim made that the method herein described is essentially new. There are, however, certain details which facilitate the wiring of a broken jaw, and assure the surgeon that the parts will be brought absolutely together without interfering with the alignment or articulation of the teeth. It is rather difficult to bring the broken parts of the mandible together with wire sufficiently strong to hold the parts rigid afterward, without distortion or interference with the normal alignment.

The writer's method is to lace the teeth together, commencing at two points on each side of the break which will give, approximately, the same rigid anchorage, with two thicknesses of wire of about 30 gage, leaving two or more teeth on each side of the break not engaged with the first wire. This allows the ligature to be drawn straight across the inside or lingual aspect of the arch, and conformed to the curves on the outside or buccal surface, as in Fig. 1. This, however, will differ in its application according to the location of the fracture. After this wire has been drawn and fastened so that the slack is taken up, but with no great pressure brought to bear on the first lacing, a number of loops of wire are cut (Figs. 2 and 3) and passed

Fig. 2.

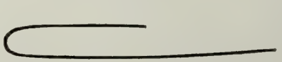
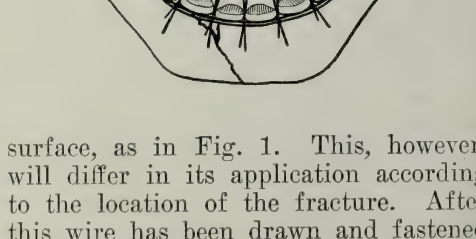


Fig. 3.



between the teeth so as to include the main wire on the inside and that portion which conforms to the wire outside of the arch. This is done with each of the free teeth, or those not included in the first lacing, as in Fig. 3.

FIG. 4.

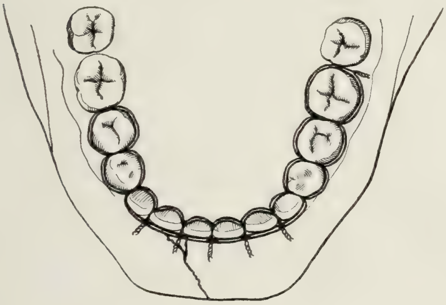
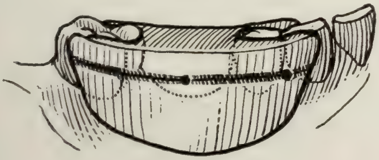


FIG. 5.

FIG. 6.



The patient is instructed to close the teeth naturally, and to hold them in that position which gives the normal articulation and relative position. The wire loops are now twisted so that the main wiring is tightened at the most advantageous points, decided upon by the operator, and the loops tightened at the different stations in order that the broken parts may be drawn together

FIG. 7.

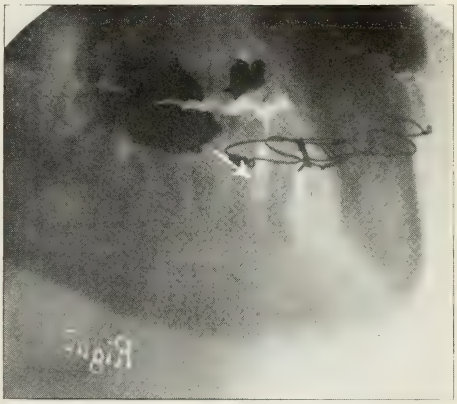


FIG. 8.

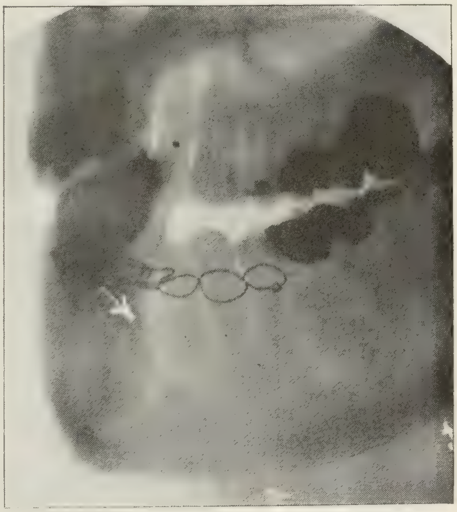
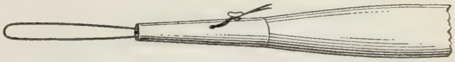


FIG. 9.



without distortion, the force being continued until the wire is absolutely taut and rigidity is obtained. (See Fig. 4.)

Fig. 5 shows the ligatures in position in the case of a double oblique fracture at the symphysis directly after the wiring was applied, and pictures the parts in absolute contact.

If some of the teeth have been carried away, and the integrity of the arch impaired, a small piece of vulcanite rubber made from a wax pattern may be inserted to bridge the space caused by the loss of teeth, so as to re-establish the normal relative position of the arch when the force is applied. (See Fig. 6.)

This method may be employed wherever teeth can be wired, and will not necessitate, in the vast majority of cases, the rigid wiring of the lower teeth to the upper, especially if no teeth have been lost.

In the case described. the patient, who was fifty-four years of age, was able at all times to eat three meals a day, composed of soft food requiring the least force in mastication, and complete bony union was obtained in exactly five weeks, as shown in Figs. 7 and 8.

There was at no time any interference with the articulation of the teeth, and the patient attended to his duties regularly without discomfort. To facilitate the application of the wire ligature the writer has used with satisfaction an instrument shown in Fig. 9, which enables the operator to exercise a more sensitive touch, thereby avoiding undue pressure, and consequent breaking of the wire. The wire is fed through the opening in the end of the instrument, and is not severed until the ligating is completed. This enables the surgeon to see the field of operation more completely, so that at the proper time he can twist the ends firmly, and cut them off at the desired point.

1700 Locust st.

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CORRESPONDENCE

The Dakin-Carrel Antiseptic Solution.

To the Editor of the Dental Cosmos:

Sir,—When the value of Dakin's solution as an efficient general disinfectant was first announced in the general press, my attention was called to the possibility of its employment in dealing with peridental foci of suppuration, but the exact formula for its production was not then available; other matters, moreover, occupied my time to the exclusion of any real effort to acquaint myself with its precise composition. Although, in the interim, Carrel, who had demonstrated its value in his work in France and Switzerland, had published the full directions for its preparation and employment (*Journ. Am. Med. Association,* v, 67, December 9, 1916, p. 1777), I neglected to make any trial of the solution, clinically or otherwise, until in January of the current year, when my attention was again called to it, and I was asked to apply it in his own case of pyorrhea, by Dr. John J. Riley of Bluefields, Nicaragua.

Dr. Riley had attempted its use both in general surgery and in connection with a number of severe cases of pyorrhea in his practice in Central America, but had likewise failed to obtain and follow the needed directions for its preparation and use. He found his attempts accompanied by so much local irritation that in spite of the readily recognizable disinfection obtained, he felt it necessary to make the trip from his home to the United States in order to make personal observation of its use. After following the work of Dr. W. O. Sherman of Pittsburgh for a time, he was able to personally conduct a number of applications in suitable cases in the German Hospital of Philadelphia, under Dr. John B. Deaver of this city, and asked that I employ it in his own case of pyorrhea and such other cases as might permit its use in trial.

I had the solution prepared in accordance with Dr. Riley's instructions, which followed fairly closely the directions published by Carrel, and at first brought it into contact with the contents of pyorrhea pockets directly, under the microscope. Contact of the solution in full and in reduced strengths was in a few moments followed by a cessation of movements of amœbæ, spirochætæ, and motile bacteria in the preparations. The amœbæ were found to change in appearance, becoming more and more hyaloid, the clear ectosarc seeming to increase at the expense of the vitally granular endosarc until the latter almost or quite disappeared. This change in the amœbic parasites was quite like that which has been noted in them in analogous observations of contact of solutions of emetin with these parasites (Kolmer and Smith, *Journ. of Infectious Diseases,* v, 18, No. 3, March 1916, p. 247). Beginning with weak solutions and rapidly increasing the concentration to the full strength of Dakin's solution, as it was found that no unpleasant effects were produced in Dr. Riley's case, the suppuration was soon in abeyance, and shortly ceased entirely as far as gross observation indicated, the attendant redness and swelling of the gums disappearing at the same time, but without actual closure of the pockets in healing.

I immediately made use of the remedy in other cases of pyorrhea with equally satisfactory results, and thereafter also employed it in cases of apical abscesses —at first in several with fistulous openings, and afterward in apical abscesses closed save for the intradental route. In one of the latter, mildly painful symptoms lasting for twenty-four or more hours were complained of by the patient; with this single exception, however, all of the patients were without evidence of local irritation, whether the focus of suppuration was an open or a closed one, and in all the suppuration to gross appearance was eliminated. Dr. E. R. Sausser and Dr. W. J. McKinley of this city have been kind enough to carry on collateral experiments in their practices, and they report to me similar favorable results.

Whether the use of a remedy in which the important agent is essentially free chlorin, with perhaps associated chlorin salts in the form of hypochlorites, chlorites, chlorates, and sodium chlorid, will have any as yet unappreciated harmful effects must of necessity be left unanswered for the present. The question of immediate local irritation—when the solution is introduced solely into the pyorrhea pockets and when avoidance of bringing it in contact with the oral mucous membrane is carefully sought—may be set aside, from the statements above made, as apparently in confined foci the chance of immediate irritative effects is trivial, if existing at all. What influence the free chlorin might have on the calcium of the tooth structure is not determined; it is probably at most trivial, if existent. Its action upon gold and amalgam fillings is also *nil.* That it is a powerful antiseptic and disinfectant when it is used as a fresh and proper solution may undoubtedly be accepted. But it is to be remembered that the Dakin solution is not stable, and rapidly loses its efficient free chlorin, even after standing for but a few days, especially if exposed to light and warmth. It should be available in fresh solution; if kept at all, it should be kept in a colored bottle and in a dark and comparatively cool place. It is irritant upon the unbroken skin and mucous membranes, and it is well to lightly anoint the free surface about a pyorrhea pocket with vaselin before introducing the solution, to protect against the probable overflow of the solution before it becomes diluted by the mouth fluids to a harmless degree.

For a detailed statement of the method

of preparation, reference may be made to Dr. Carrel's letter to the *Journal of the American Medical Association* above referred to. Simplified methods of manufacture, avoiding the careful determination Dakin and Carrel advise of the strength in available chlorin of a given specimen of chlorinated lime, and the exact separation of the chlorin of the solution by sodium bicarbonate and neutralization by boric acid, have been proposed—as recently in the *Journal of the American Pharmaceutical Association*, as follows:

Sol. chlorinated soda (U.S.P.IX),	200 cc.
Sterile water,	800 "
Boric acid,	4 grams.

Yet it would be well, in trying this or any other remedy in new lines of use, to adhere strictly to the prescribed methods of preparation of the agent, from the standpoints both of safety to the patient and proved efficiency of action, and also that of proper scientific observation and comparison. Any competent pharmaceutical chemist can follow with ease Dr. Carrel's full instructions, and no difficulty should be met in obtaining the product as required.

The undersigned offers this note for publication in your valued journal in the hope that others may be induced to try this agent, to the end that by collective observations a sound evaluation of its properties may the more quickly be arrived at in dental practice.

Very sincerely,
M. T. BARRETT, D.D.S.
PHILADELPHIA, PA.

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Academy of Stomatology of Philadelphia.

Regular Monthly Meeting, held November 28, 1916.

THE meeting was called to order by the president, Dr. Lee, at 8 P.M. The minutes of the previous meeting were read by the secretary and approved.

The President introduced as the speaker of the evening Dr. THOMAS G. ALLER, who read a paper entitled "The Operative Treatment of Prognathism."

[This paper is printed in full at page 391 of the present issue of the COSMOS.]

DISCUSSION.

Dr. J. G. Lane. I cannot help admiring the courage of a man who will undertake to cure by means of surgery a case such as has been shown here tonight. A man who can do that is entitled to all the glory and recompense possible. It represents an extreme possibility, and the result is certainly beautiful. From almost any viewpoint the result is as nearly ideal as can be expected in the ordinary case, and this was an extra-ordinary case.

I shall not differ with Dr. Aller in regard to his treatment. The occlusion he has obtained is more nearly perfect than most dentists obtain, orthodontists included; but there are some features in regard to the treatment that I think need more explanation. For instance, he says, "History negative." Let us consider that for a moment. I have in mind an incident that occurred a couple of years ago, when a dentist brought a case to me for consultation. One of the first questions I asked was, "What is the cause of this?" and the answer was, "Nothing; just natural." These things are not natural, and the history cannot be negative. I should like Dr. Aller, in closing, to tell us something of the glandular structures, their condition, action, and size. Then I think you will find that we have a good deal of information with regard to the history of the case. Dr. Aller casually referred to the etiology of prognathism, quoting Brophy as attributing it to inattention to the teeth during the period of eruption. Even granting that the teeth do occlude improperly during eruption there must be something radically wrong with the general anatomy, or else the teeth would not assume improper positions. The conditions, therefore, are not negative; there is something that causes the deformity. It is not merely a matter of false position; there is something else back of it.

Dr. Aller referred to Blair as considering this form of prognathism due to a sliding forward of the mandible as a whole and the enlargement of the tongue. Probably there is a sliding forward of the mandible, but why?

Next the essayist referred to the cause as being atavism. We can start at the lowest animal form and come up the scale of evolution, and not find a group or class with any tendency to atavism of that kind. Some of the carnivora, it is true, do have a tendency in that direction, but it is the result of breeding, and not of evolution. Moreover, the branch from which these carnivora are descended comes off from the parent stem so remotely that man is descended from an entirely different line. Therefore I do not believe the matter can be explained in that way.

Granting that the cause has not been explained, I question whether there is anyone who is in a position to correct by any arbitrary method something of which the cause is not known. It is possible that in the correction there may be other conditions developed or established which will later produce some other bad result. The case shown on the screen and referred to in the paper tonight is, in all probability, the worst that any of us has seen. It is the worst I have ever seen. The cases that come to us for treatment are of the same class, although not necessarily so pronounced. I have yet to find one, however, that did not have a history of abnormal tooth conditions. Let us consider some of the conditions that may be contributory factors to maldevelopment of the jaws.

With enlarged tonsils—whether pathological or otherwise, it matters not—we have a narrowing or a constriction of the air-space back of the base of the tongue. There is only one direction in which the tonsils can enlarge, and that is toward each other. They cannot enlarge distally, on account of the anterior spinous processes; and they cannot enlarge in a direction away from each other, because of the presence of other tissues. They may also, perhaps, enlarge in a forward direction as well as toward each other. The base of the tongue is in front of the tonsils, but it is not composed of tissue of great resistance, and therefore permits of some enlargement in this direction. The patient, in attempting to get more breathing space, as he will naturally try to do, will be able to obtain it only by forcing the tongue forward with the end pointing downward. We know that any pressure brought to bear on the teeth will change their position. If it is exerted after the bone is fully formed, the effect will be shown in the transitory tissue, the alveolar process, but if it is exerted when the mandible is still developing the whole mandible will be more or less subjected to that influence. A very little pressure will move everything along. That is where we have the simple laws of dynamics at work.

Let us now study for a moment another phase of the question. We rarely have enlarged tonsils unless there is a pathological condition. It does not take much trouble in the lingual tonsil to produce an effect on the tongue. Therefore we have a logical reason for an enlarged tongue—*i.e.* if the latter is continually at work trying to make breathing space, it will develop abnormally, as does any other muscle with over-exercise. Now, let us suppose that we suddenly lose a portion of the space in which the tongue has to work, what is likely to happen? A recurrence of the previous condition sooner or later, or else the tongue, not having sufficient space, will be pinched around its edges by the teeth. If that pinching is kept up too long, there is a liability of malignant trouble developing.

The case shown happens to be of the kind that could be treated by cutting out sections and moving the mandible distally, space lingually being all that was needed to put the molars in occlusion. The average case, however, is so much widened laterally that the plan would not be practicable.

The various cases that have been operated upon in this manner—and there have been comparatively few of them, as far as I can learn—have not been by any means uniformly successful. Dr Angle has been quoted in the paper, but this was his opinion at the time when he was enthusiastic on this particular subject. It did not take him long to change his mind, and I do not think he would express that opinion now. While this is a commendable operation when everything is favorable and it is all right for us to try it under such circumstances, I should be inclined to use caution in employing it.

There is just one more thing I wish to refer to, and that is that Dr. Aller spoke of this condition of prognathism as being comparatively rare in the Caucasian race, but more common in savages. I do not think the records will bear out that statement. If you examine the skulls of savages you will find that the teeth are usually in excellent occlusion. The condition, as shown, is more prevalent in the Caucasian race than in any other at the present time, and is due to pathological changes, as I have tried to explain. In correcting such a case, one further question should be considered: Unless we can remove the predisposing cause, are we justified in making a correction that is not going to harmonize with the surrounding conditions? If we do, may we not expect a recurrence of the same condition?

Dr. W. Wayne Babcock. Both the dentist and the surgeon can profit by a discussion on a subject of this sort. Whereas the surgeon is usually at fault because he does not know what the dentist can do, the reverse is sometimes the case, the dentist being at fault in not knowing what the surgeon can do. What I shall have to say will be purely from a surgical standpoint. Any remarks that I may make from a dental point of view will, of course, not be *ex cathedra.*

First of all I wish to pay a little tribute to Dr. Hullihen, almost a backwoods surgeon, who performed the first operation for a deformed jaw, due to a burn. He had three conditions to correct. The front of the jaw was deformed, the anterior incisors having been pulled down and forward, the lower lip everted, and the chin bound down to the front of the chest by a cicatrix. The mouth was open and the tongue tended to protrude, and saliva exuded. Hullihen with a saw mobilized an anterior segment of the jaw containing the incisors, and so fitted it in position as to restore the dental arch and secure good occlusion. Although he had not our present methods of anesthesia, and knew nothing of antiseptic measures, he made a success of this first part of the operation.

Then he corrected the deformity of the lip, and finally did a tremendous plastic operation, which even now we should consider meritorious. The large scar was so replaced by a skin flap that the girl could raise her head, and resulted in a practical restoration. I think we should give this man a great deal of credit, and we should take a degree of pride in the fact that this was, like so many dental procedures, originated and carried out by an American.

From an anatomical and physiological standpoint, I should like to say something of the vessels and nerves supplying the lower jaw. There has been a fear that resection with division of the inferior dental nerve might do some harm. I am not sure what your experience as dentists has been, but not infrequently we destroy the inferior dental nerve on one side or both sides as thoroughly as we know how, and yet have no bad results in the mouth. The method that I have adopted has been to make an incision inside the mouth in front of the ramus; separate the tissue from the ramus to the spine of Spix, and then inject osmic acid, in practically a saturated solution, about the inferior dental foramen. Where this acid touches it sears and chars the tissues so that they turn black. The nerve and associated bloodvessels are destroyed to such a degree that there is a mass of cicatricial tissue formed, preventing the regeneration of the nerve. This method of nerve destruction gives a more prolonged period of analgesia than does the injection of alcohol, and yet seems to cause no ill effects upon the jaws or teeth. When we perform a surgical operation and divide the inferior dental nerve, restoration of function is usually very prompt. There may be a period of analgesia, which lasts for perhaps six weeks, but usually after this there is rapid restoration of function. So, as far as the dental nerve or vessels are concerned, I think we can say that the fact that it necessitates division of structures is no serious objection to any operation.

A second point that I wish to speak of has to do with the production of a compound fracture in the mouth. This is something which surgeons have learned to fear, perhaps unduly so. The average compound fracture is produced under undesirable circumstances. The mouth has not been prepared when the injury takes place, and the traumatism is usually very violent, so that the tissues are seriously bruised and devitalized, the soft tissues as well as the bone. Despite this, we know that extensive necrosis, in the average case after a fracture of the jaw, is not so common, unless the surgeon has the temerity to go in before the tissues have recovered their vitality and further devitalize them, thus favoring the spread of infection. At the same time there is always a possibility of infection, so Dr. Aller may feel a measure of gratification at the success attending his case. Of course, it is possible in an operation like the one he performed, to put the patient in the best condition to withstand infection, and it is quite feasible to extract a tooth, if it be necessary, and after healing has taken place perform a submucous operation, working from underneath the jaw, and thus avoid the possibility of infection from within the mouth. There has been a tendency by those who do not realize the progress that has been made by surgery in cosmetic operations to feel horrified at any operation that includes division of the tissues of the face. Incisions can be hid by being made under the jaw, or the scar may be rendered practically inconspicuous by a very careful coaptation of the layers of the skin. Also, if there be deformity in the contour of the face, the modern methods of transplanting fat or other tissues have become so perfect that facial symmetry may be restored. By making an appropriate section of the bone, one can render the jaw any size desired, and by fat implantation restore any defect in the contour. Where the chin or side of the mandible, through an accident or infection, is deficient, or where an unsightly, adherent, or depressed scar is present, it is entirely feasible to loosen or excise the cicatrix, and by fat implantation overcome the disfigurement.

As to the reduction in the size of the arch of the jaw, my experience has been limited in sections made through the ramus to three cases, and I should like to perform these operations again, as I have since found out so much I might have done, and which I failed to do at the first operations.

First of all, I have been impressed by the fact that the section, which may go through different parts of the mandible, as seems best in the particular case, should be associated with enough freeing of the soft tissues to allow the jaw to fall back in position without any tension. One should place the parts in position, and so mobilize them that it will not require extensive wiring or apparatus to hold the jaw in position. In order to make the later support better in one case, I put in Lane splints to hold the fragments together. There should be no interposed soft tissues between the fragments. If one makes a simple division of the rami, too often soft tissues will become interposed, and when the retentive appliance has been removed after allowing the proper time for healing, the bone will slip out of position, because there has not been proper bony union. It is important, therefore, that the section be properly made, the tissues so freed and divided and the bone so fastened in position that the operation of itself will practically hold the jaw in position afterward, the dental appliance being employed only to maintain support until the healing has taken place.

These ramus operations are somewhat more troublesome than and not so feasible in certain cases as the method which Dr. Aller has described. One should, however, vary the operation so as to best overcome the deformity. If a change in the angle of the ramus is the chief desideratum, a division somewhere through the ramus is to be considered. It depends somewhat upon the particular operator whether he enters through the mouth or through the external skin.

An important factor in many cases is the presence of a very small upper jaw, and it is a question as to whether we should not consider methods of enlarging or moving the upper jaw. Surgically, this is feasible. Tumors in the nose have been attacked by mobilizing and separating the maxillæ, and thus getting access to the pharynx. By a similar procedure it is possible to move or enlarge the upper jaw, but this is fraught with some danger, and it is a question as to whether in the average case this should be done.

In one case the large size of the tongue and the small cavity of the mouth gave me some concern, as was mentioned by the previous speaker; yet the tongue has a wonderful power of adapting itself to its cavity, and when the jaw was put back in that case, the patient soon acquired the ability to manage her tongue in the greatly restricted space. As a rule, we need not fear compression of the tongue.

I would say, also, that there is one little point on which I must disagree with Dr. Lane; that is, it *is* entirely feasible to alter the size of the tongue, and it is not a serious operation under local anesthesia. A large tongue may be resected by means of wedge-shaped incisions, which may nearly encircle the organ. The parts are brought together by sutures, and the tongue heals quickly. The removal of a considerable portion of the tongue produces very little disability. In cases of cancer, when even one-half or two-thirds of the tongue is removed it is surprising how quickly the tongue contours itself to the mouth again, and seems to acquire a size, shape and movement resembling the normal organ. If there be reason for it, resection of the tongue is not a very difficult operation; healing is prompt, and secondary disability usually absent.

In prognathism and related deformities it is for the orthodontist to say whether there is a possibility of occlusion by the means at his command, or whether one or both jaws should be altered in size or position. If it is found that the alteration can be accomplished only by surgical measures, one of various procedures that have been advocated should avail.

Dr. Aller (closing the discussion). It is a great source of satisfaction to have these points brought out. I think we are all heartily agreed that in all such cases, from the beginning and through the treatment, an orthodontist should be in attendance and be frequently consulted, and his ideas and recommendations followed closely.

I said in my paper that the history of the case was negative, and it practically was so. There was a vague history of the patient having sucked her thumb in childhood. There was no disease of the tonsils, but the tongue and tonsillar tissues were somewhat enlarged.

I should like to know whether Dr.

Lane does not believe in the possibility of the deformity occurring first, the tongue and tonsillar tissue enlarging secondarily. After the lower front teeth had lost the antagonistic surface of the upper anterior teeth, the body of the jaw would elongate, and the tongue, if given a larger space, would push forward of its own accord. As has been the experience of Dr. Babcock, when the space is narrowed, the tongue soon accommodates itself, although enlarged, to the smaller space.

This case gave no history of pharyngitis or throat trouble, although there was enlargement of the lingual tonsil and of the tongue.

I spoke of relaxation of the ligament. As in the shoulder, when the capsular ligament is enlarged and weakened, there is a tendency to recurrent dislocations of the shoulder, so, if the ligaments of the articulation of the jaw are loose and relaxed, there is a continual tendency for the jaw to slip forward, and if there be sucking of the thumb in childhood, this constitutes a great factor in throwing forward and elongating the lower jaw.

Dr. Lane spoke of the early extraction of a deciduous tooth, and named that as one cause of the later resulting deformity. That is true, as I mentioned in my paper. Inattention to the teeth during eruption was held by Brophy to be a factor, and one to be specially considered.

Dr. Lane also spoke of the widening of the jaw between the angles. The case I saw with him certainly was a wide one. After seeing the models, we agreed that such an operation as I have described would not be advisable in this particular case, because of the position of the molars and the increased width across the jaw. If the second molars—both upper and lower—were brought together and made to occlude normally it would restrict the tongue too much, and it did not seem possible to obtain any result worth while. As Dr. Babcock has mentioned, the upper jaw should be first carefully examined in order to note whether the lower is actually contracted. This contraction, if present, may be either real or apparent. If real, the fault is in the lower jaw, but if only apparent, the upper jaw may be entirely at fault, and must receive all the attention.

Regarding compound fractures, Dr. Babcock has mentioned the fact that he does not favor compound fractures in the mouth. One operation that he recommends, going through the rami within the mouth, does give a compound fracture. As to elevating the periosteum and making a submucous resection, which I mentioned in my paper, there certainly is a tendency of the parts to be pretty well removed from the bone. After you get up a certain distance, you should take a curved needle and slide over the jaw without removing the periosteum at that point. The tooth having been removed a month before, you have a healed surface. This raising of the periosteum tends, under some circumstances, to retard the union, and I feel that it is not so desirable a procedure.

With regard to operating through the mouth and the infection that often follows, I wish to say that we took two days in which to get the mouth in as aseptic condition as possible. At Blockley, it seems as if all the people who get fractured jaws are poor, and they all seem to have terribly infected mouths. If one is considering an operation of this kind, he should have a dentist clean the mouth thoroughly, and have the patient use antiseptic mouth-washes, taking a day or two to go over the mouth and get it clean before the operation; then, after the operation is done and the edges of the wound approximated, he should use the Whitehead varnish, which will produce an almost waterproof condition, keeping the fluids of the mouth out of the wound. This will avoid a great deal of trouble. I have always wondered why it is that the men who remove tonsils, the laryngologists, take such pains to sterilize their hands and their instruments, and yet do not have anyone to prepare the mouth beforehand. They go through, with their sterile hands and sterile instruments, a cavity in which they have not even tried to eradicate the infection. One man prominent in that line of work, when asked if he did not get bad results, admitted that he had had abscesses of the neck develop after operations, and I know of cases in which the slough in the wound from which tonsils had been removed looked like diphtheritic membrane. I feel that in all these cases dentists should be consulted, and the mouth put in good condition before operating.

The meeting adjourned at 10.05 P.M.

Regular Monthly Meeting, held December 19, 1916.

AFTER a dinner at the Arcadia café, the meeting was called to order by the President at eight o'clock.

The following officers were elected for the ensuing year:

President—Dr. Emerson R. Sausser.
Vice-president—Dr. W. A. Jaquette.
Secretary—Dr. W. Stirling Hewitt.
Treasurer—Dr. A. E. Bassett.
Member of Council—Dr. T. D. Casto.

The newly-elected president, Dr. Sausser, took the chair and introduced as the speaker of the evening Dr. THEODORE D. CASTO, who presented a paper entitled "Changes Produced in the Blood by Nitrous Oxid-Oxygen Anesthesia."

[This paper is printed in full at page 415 of the present issue of the COSMOS.]

DISCUSSION.

Dr. L. Napoleon Boston. It is impossible, with a paper such as Dr. Casto has presented here tonight, to discuss it from the usual standpoint, that is, pointing out the particular phases on which there may be differences of opinion, because he has presented actual figures and findings from experimental work. The fact that I at one time studied the effect of ether on human and animal subjects does not enable me to find any flaws in his work, because what he has presented tonight is quite different from the work I did. He has reported a great deal that I am sure will be noted everywhere, for unless I am not familiar with this phase of our literature—and I believe I am fairly so—nothing has been done along this line before.

It is a grand thing for the Academy of Stomatology to have a paper of this sort first presented here, because, as I understand it, the introduction of the use of anesthetics really came through the dental branch of our profession, and from that time to the present most of the great work along the lines of anesthesia has been done by dentists. Twenty years ago I attended a meeting held to celebrate the discovery of anesthesia by Horace Wells, at which Dr. J. E. Garretson presented a paper on Anesthesia; and it seems strange that I should be able to live and practice in Philadelphia twenty years later and still find that the subject puzzles us. Nevertheless, we are learning more and more about it every day.

Before we pass to a consideration of the blood, I think this is a good opportunity to impress upon you what anesthesia really means.

Anesthesia is nearest to being divine of anything we have that is not so. While we say that anesthesia was first discovered by Wells, the principle of anesthesia was first recognized by a man known as a horse-doctor in the northern part of England, who found that if he held a female dog by the feet for a number of minutes before performing an ovariotomy, the animal did not "cry" during the operation. He came to the conclusion that the dog had more blood in its brain than it otherwise would have had, and that this inhibited sensation. Investigation was made by removing and examining heads from dogs held in that way, and it was found that there was abnormal congestion in the venous circulation of the brain. So that two or three hundred years ago men were investigating the subject that Dr. Casto has been following up during the past year.

I became interested in nitrous oxid and oxygen anesthesia through Dr. Casto, to such an extent that I persuaded a surgeon up town to use this method of anesthesia in his cases. We secured a private nurse, and she has anesthetized, during the past thirteen months, one hundred and ten patients, all of whom had some serious disease and needed serious operation—some for appendicitis, some abscesses of the liver, many ulcers of the stomach, diseases of the uterus or ovaries, and similar conditions. In every patient the urine and blood were examined, a general chemical analysis made of all the secretions before the anesthetic was given, and the examinations and analyses repeated at stated periods after operating. As the result of this investigation we have found that this method of anesthesia as applied to general surgery is far better than any other method we have yet used.

We have discovered, further, that we have not had any cases of pneumonia following these operations. Surgeons always have a certain number of cases of pneumonia after operation, because in all septic cases there is a secretion in the throat and from the bronchial mucous membrane as soon as we begin the administration of ether, and in their struggle against the anesthetic patients inspire a certain amount of mucous, which becomes deposited in the lungs. Then, about three days afterward, there may develop disseminated areas of infection in the lungs. All these cases prove fatal, and we get one in about every two hundred operations under ether. We have not had a single case of pneumonia, however, as the result of nitrous oxid and oxygen anesthesia. Neither have we had any in which the amount of albumin in the urine was increased—and some of these patients had Bright's disease. Many surgeons use this method instead of ether in some of their cases, but this surgeon to whom I refer uses it in all his operations.

The one disadvantage that might be mentioned is that in five of the one hundred and ten cases, the last of which was operated today, we could not reduce the abdominal muscles to a sufficiently relaxed condition to enable us to perform an abdominal operation. A peculiar fact is that these muscles remain tense, as do the chest muscles also. In order to overcome this difficulty, we must add a small amount of ether to our anesthetic. That the amount necessary is very small, however, is shown by the fact that we can keep the patient under the influence of the anesthetic for an hour and a half without having to add more than three drams of ether to the nitrous oxid and oxygen.

I am sorry that I cannot discuss Dr. Casto's paper in the sense of tearing it apart, as it were. I am not sufficiently conversant with the latter part of it to do so. I believe that the time has come when we should get closer together in our methods of anesthesia, and bring the work of your branch of the profession and ours into direct contact. I think we shall soon use the method we have had presented to us tonight fully as much as any other method.

Jos. S. Hepburn, A.M., M.S., Ph.D. I have been requested to discuss the paper of the evening, on "Changes Produced in the Blood by Nitrous Oxid-Oxygen Anesthesia," from the viewpoint of biological chemistry, with special reference to the chemical changes produced by anesthesia, their significance, the methods used in their study, and the underlying principles of those methods—*i.e.* to discuss

Certain Phases of the Biochemistry of Anesthesia.

The nature of electrolytic dissociation may be seen by a study of the behavior of the aqueous solutions of two chlorids, sodium chlorid and ethyl chlorid. The solution of sodium chlorid conducts the electric current and gives the reactions of the chlorids, *e.g.* a precipitate of silver chlorid forms on the addition of an aqueous solution of silver nitrate. The aqueous solution of ethyl chlorid does not conduct the current and does not respond to the common tests for chlorids. The molecule of sodium chlorid in aqueous solution is dissociated into the sodium ion Na^+, which may be considered as a sodium atom plus a positive charge of electricity, and the chlorid ion Cl^-, which may be considered as a chlorin atom plus a negative charge of electricity. These ions give to the solution its power to conduct the current, and to participate in chemical reactions. Ethyl chlorid is not dissociated; this explains why its aqueous solution does not respond to tests for chlorids and does not conduct the current. Other phenomena support this theory of dissociation of electrolytes in solution.

All acids dissociate into the positively charged hydrogen ion H^+, and a negatively charged ion, the acid radical (Cl^-, Br^-, $SO_4^{=}$, etc.) All bases dissociate into the negatively charged hydroxyl ion $(OH)^-$ and a positively charged metallic radical (Na^+, K^+, Ca^{++}, etc.). The chemical reaction of a given solution is governed entirely by its hydrogen ions and hydroxyl ions. If the hydrogen ions and the hydroxyl ions are present in equal concentration the solution is neutral; thus pure water is neutral in reaction, though it is slightly dissociated into hydrogen and hydroxyl ions.

In analytical chemistry, a normal solution is a solution containing 1 gram equivalent of a compound per liter. One liter of water at 20°C. contains 0.0000001 gram equivalent of *dissociated water,* hence has both an acidity and an alkalinity 0.0000001 normal. The hydrogen ion concentration of a neutral solution then is 0.0000001 normal, also written 10^{-7} normal, or as suggested by Sorensen,* pH7.

In a given solution, if the hydrogen ions are in greater concentration than the hydroxyl ions, the solution is acid; if the hydroxyl ions are in greater concentration than the hydrogen ions, the solution is alkaline. Thus if the hydrogen ion concentration be 0.000001 normal (10^{-6} normal, or pH6) the solution is acid. If the hydrogen ion concentration be 0.00000001 normal (10^{-8} normal, or pH8), the solution is alkaline; this hydrogen ion concentration is that of a solution which is 0.000001 normal *alkaline.* In other words, the reaction of a solution may be stated quantitatively by its hydrogen ion concentration pH. If the numerical value of pH is 7, the solution is neutral; if the numerical value of pH be less than 7 the solution is acid; if the numerical value of pH be greater than 7, the solution is alkaline.

Ostwald's theory of indicators* is closely related to the theory of electrolytic dissociation. An indicator is a weak organic acid which is but little dissociated in aqueous solution; hence in a solution which is acid the indicator exists in solution as *undissociated molecules,* and the color which it imparts to the solution is that of these molecules in solution. However, the indicator forms a salt which is strongly dissociated; hence in a solution which is alkaline the indicator exists in solution *dissociated into ions,* and the color which it imparts to the solution is that of its negatively charged acid radical or anion in solution. Thus, in solution the molecule of phenol-phthalein is colorless, the anion red; the molecule of Congo red is blue, the anion red; the molecule of litmus is red, the anion blue. With every indicator there are definite hydrogen ion concentrations between which the transition from dissociated salt to undissociated acid gradually occurs.

Take for instance phenol-sulfone-phthalein,† used in the method of Levy, Rowntree, and Marriott‡ for the determi-

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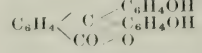
* *Ergebnisse der Physiologie,* 1912, xii, 393.

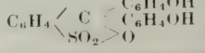
* H. C. Jones, "A New Era in Chemistry." Van Nostrand, 1913, p. 182.

† Phenol-sulfone-phthalein is closely related chemically to phenol-phthalein, which is used as a purgative. The relationship may be seen in the following formulæ:



$$C_6H_4 \begin{matrix} \diagup C \begin{matrix} C_6H_4OH \\ C_6H_4OH \end{matrix} \\ \diagdown CO - O \end{matrix}$$

Phenol-phthalein.



$$C_6H_4 \begin{matrix} \diagup C \begin{matrix} C_6H_4OH \\ C_6H_4OH \end{matrix} \\ \diagdown SO_2 > O \end{matrix}$$

Phenol-sulfone-phthalein.

The sodium salt of phenol-sulfone-phthalein is used in the well-known renal function test.

‡ *Archives of Internal Medicine,* 1915, xvi, 389.

nation of the hydrogen ion concentration of blood. When the numerical value of pH is below 6.4, this indicator exists in solution only as undissociated molecules which impart a pale straw-yellow color to the solution; when the numerical value of pH is above 8.4, this indicator exists in solution only as its dissociated salt, and its anion imparts to the solution a red color. Between these two limits of pH there exists in solution a mixture of undissociated molecules of the indicator and dissociated molecules of its salt; consequently the color of the solution is the resultant of the yellow due to molecules and the red due to anions. Since the number of undissociated molecules decreases and the number of anions increases as the numerical value of pH becomes greater in passing from pH6.4 to pH8.4, there is a gradual passage from yellow to red through the various qualities of color obtained by blending these two colors in various proportions. By comparison of the color imparted by phenol-sulfone-phthalein to standard solutions of known pH concentration with the color imparted by that indicator to a solution of unknown pH concentration, it is possible to determine the pH of the latter solution, provided it lie between pH6.4 and pH8.4. Needless to remark, the absolute concentration of the indicator must be the same in all the solutions.

The purpose of the dialysis to which the blood is subjected prior to determination of its pH deserves attention. The blood is placed in a celloidin sack; this is then suspended in a solution of sodium chlorid which is isotonic with, or has the same osmotic pressure as, the blood (physiologic salt solution). This solution contains phenol-sulfone-phthalein in the same absolute concentration as the standard solutions of known hydrogen ion concentration.

The celloidin sack serves as a membrane which readily permits the passage of crystalloids, or compounds that crystallize, but permits the passage of colloids (compounds that do not crystallize) with great difficulty, if at all. The membrane may be looked on as a sieve with exceedingly minute holes; the crystalloids have comparatively small molecules, which pass through these holes; the colloids of the blood have very large molecules and pass through the holes with great difficulty. The compounds on which the hydrogen ion concentration of the blood chiefly depends—phosphates and carbonates—are crystalloids, and therefore rapidly pass through the membrane; the proteins and coloring matters of the blood, which otherwise would interfere with the determination of its hydrogen ion concentration, are colloids, and are not found in the dialysate at the end of a ten-minute period of dialysis. At the end of that time the pH concentration of the dialysate and of the blood are the same; so the celloidin sack is withdrawn, the color of the dialysate is compared with that of the standards, and the pH of the blood thus determined.

A close relationship exists between metabolism, respiration, and the reaction of the blood. The ingested food, after digestion and absorption, is burned in the tissues; the *chief acid product* of this combustion is carbon dioxid (CO_2), which combines with water to form an unstable acid, carbonic acid (H_2CO_3). The carbonic acid is absorbed by the blood plasma by virtue of the reserve alkali of that fluid, and is transported to the alveoli of the lungs, where it is eliminated from the blood in the gas exchange, and is expelled from the body in the act of expiration.

According to Haldane* the carbon dioxid content of the alveolar air, and of the air dissolved in the blood leaving the lungs, is about 5.6 per cent under normal conditions. The carbon dioxid of the blood stimulates the respiratory center and thereby controls respiration.

When the carbon dioxid content of the circulating blood and of the alveolar air becomes greater than its normal value, an added stimulus is imparted to the respiratory center, which causes breathing to become deeper and more frequent. As a result, the excess of carbon dioxid is eliminated from the body through the lungs, and the normal alkalinity or hydrogen ion concentration of the blood is restored. The purpose of "rebreathing" in nitrous oxid and oxygen anesthesia is to increase the carbon dioxid content, or partial pressure of carbon dioxid, in the alveolar air, and thereby to stimulate respiration.

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* *Science*, N. S., 1916, xliv, 624.

Under certain conditions, certain acids which are not eliminated from the body through the lungs may be present in the blood, *e.g.* beta hydroxybutyric and aceto-acetic (diacetic) acids in cases of defective fat metabolism, when the fatty acids are incompletely burned by the body.

If the quantity of these acids, which are not removed by respiration, be but slight, deeper and more frequent breathing may compensate their presence and maintain the alkalinity of the blood at its normal level. When larger quantities of such non-volatile acids are present, the normal alkalinity of the blood cannot be restored by increased respiration; the alkali reserve of the blood is diminished, the blood may become neutral or even acid in reaction, and a state of acidosis is present. Acidosis may occur during starvation, in eclampsia, in certain disturbances of the gastro-intestinal tract, in phosphorus poisoning, and as a result of narcosis from chloroform or ether. The work of Sherman and Sinclair* and of Sherman and Gettler† indicates that acidosis may also be produced by a diet rich in acid-forming elements (chlorin, phosphorus, and sulfur) and poor in base-forming elements (sodium, potassium, calcium, and magnesium).

Two methods exist for the measurement of the alkali reserve of the blood—one the determination of the carbon dioxid content of the alveolar air, the other the determination of the hydrogen ion concentration of the blood both before and after removal of its loosely combined carbon dioxid. The latter procedure has been used in the paper of which this is a discussion. The hydrogen ion concentration, pH, was determined as directed by Levy, Rowntree, and Marriott, then the residual hydrogen ion concentration, RpH, was determined by the method of Marriott.* In other words, the pH was determined colorimetrically by means of phenol-sulfonephthalein in the dialysate from the blood; the loosely combined carbon dioxid was then removed from the dialysate by forcing a current of air through the latter for three minutes; and finally the RpH was determined colorimetrically by comparison of the carbon-dioxid-free dialysate with the standards of known hydrogen ion concentration. The difference between RpH and pH was a measure of the alkali reserve of the blood.

The research which has been reported this evening indicates a slight tendency toward an increase in the hydrogen ion concentration (decrease in the numerical value of pH) of the blood of albino rats during anesthesia produced by nitrous oxid and oxygen. The anesthesia, as the speaker of the evening has already pointed out, also gave rise to a decrease in the alkali reserve of the blood about equal to the decrease occurring in moderate acidosis in man. The highest and lowest values of RpH obtained after anesthesia (6.6 and 8.6) are somewhat isolated. It is of interest to note that, if these two values be excluded, and the remaining sixteen values, which lie between 7.1 and 8.0, be averaged, their average is found to be 7.6, the same average as when all nineteen values were included.

Broadly speaking, the blood of normal albino rats is less alkaline than that of man; this is especially true of the values for RpH. The thought arises that possibly there is some connection between this phenomenon and the more intense metabolism of the rat. Thus, in 24 hours, man requires 24.0 calories per kilogram of body weight, the rat 227 calories per kilogram of body weight.†

Crile‡ reports that the acidity of the

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* *Journ. Biol. Chemistry*, 1907, iii, 307.

† *Ibid.*, 1912, xi, 323.

* *Archives of Internal Medicine*, 1916, xvii, 840.

† Krogh. "The Respiratory Exchange of Animals and Man." Longmans, Green & Co., 1916, p. 141.

‡ *Annals of Surgery*, 1915, lxii, 257.

blood is increased by administration of nitrous oxid. This gas was also found to increase the acidity of the urine, though to a lesser extent than do ether and chloroform. Unfortunately the quantitative figures are not given. Crile states that "Administration of the anesthetic to a starved patient with gastric or duodenal ulcer, for example, may cause death by precipitating the impending acidosis."

Kemp* found that in dogs, albumin appeared in the renal secretion in complete narcosis with nitrous oxid; the albumin was moderate in amount and disappeared soon after the administration was suspended.

Casto† noted a tendency toward decrease in the hemoglobin content of the blood during anesthesia produced by nitrous oxid and oxygen. It may be mentioned that Anders and Boston‡ noted a decrease in the hemoglobin content both of human blood and that of rabbits as a result of ether anesthesia.

While experiments apparently have not been made concerning the influence of nitrous oxid on certain constituents of the blood, such as the sugar, the amino acids, and the enzymes, similar work on the influence of ether anesthesia has recently been done, and may be mentioned briefly. Ross and Hawk§ found that inhalation of ether vapor for two hours produced glycosuria in dogs which had been kept on a carbohydrate-free diet. The glycosuria was not produced when the same animals had been kept on a mixed diet. Ross and McGuigan‖ discovered that ether anesthesia produced a hyperglycemia, or abnormally high value for the sugar content of the blood. The hyperglycemia was more marked when the dogs had been fed on a pure meat diet than when they had been fed on a diet including carbohydrate. They also report that the ether anesthesia was without influence on the diastase of the serum; this enzyme converts starch and glycogen into sugar.

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* *New York Med. Journal*, 1899, lxx, 768.

† *Dental Items of Interest*, 1916, xxxviii, 595.

‡ *Therapeutic Gazette*, 1904, xxviii (3 ser. xx), 721.

§ *Archives of Internal Medicine*, 1914, xiv, 779.

‖ *Journ. Biol. Chemistry*, 1915, xxii, 407.

The amino acids are fairly simple organic compounds containing carbon, hydrogen, oxygen, and *nitrogen;* they are the units from which the large and complex molecules of the proteins are constructed.* Two of the amino acids—leucin and tyrosin—are of clinical significance when present in the urinary sediment,† in which they may occur in acute yellow atrophy of the liver and in certain other diseases.

Ross‡ noted a decrease—usually slight—in the amino acids of the blood serum of dogs after ether anesthesia for fifteen minutes. The decrease roughly followed the amino-acid content of the blood prior to anesthesia, and rarely exceeded 4 per cent. of that content.

Dr. Casto (closing the discussion). I want to thank you, and the Council especially, for having given our committee the financial assistance that permitted us to carry on our experiments. This is not saying that the appropriation made was entirely sufficient for doing the work, but it materially assisted in completing it. We hope that next year, when we come back for a much larger sum for the purpose of testing the carbon dioxid content of the alveolar air, we may get that also.

A rising vote of thanks was given to Dr. Casto.

Dr. J. D. McLean, president of the County Medical Society, was then introduced, and made an address, urging better attendance at the meetings and a closer affiliation between the medical and dental professions.

A vote of thanks was given the treasurer and his assistants for the manner in which the banquet had been managed, after which the meeting adjourned at 10 o'clock.

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* See Bradbury, *Journ. Franklin Institute*, 1909, clxviii, 85.

† C. E. Simon, "Manual of Clinical Diagnosis," 8th ed., 1914, 448.

‡ *Journ. Biol. Chemistry*, 1916, xxvii, 45.

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

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PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, APRIL 1917.

EDITORIAL DEPARTMENT

The Field of Non-bacterial Pathology.

THOSE whose inclinations tempt them to keep in touch with current medical and dental literature cannot fail to be impressed by the stupendous field that bacteriological research has opened up in relation to the study of disease causation. For centuries the "germ theory" of disease was only a theory; indeed, for a long period of time it was but a speculative hypothesis. Close observation of disease phenomena gave increasing weight to the belief in the germ origin of disease as the only rational explanation for certain observed data, particularly those relating to disease transmission; so that, in due course, by the accumulation of evidence in its favor, the minds of medical scientists were prepared for the acceptance of Koch's demonstration of the causal relation of these minute organic forms to the disease reactions which they are now known to provoke in the animal body.

In the less than half century since the birth of the science of bacteriology by the announcement of Koch's discovery and the promulgation of his postulates and his methods of bacterial culture, the great majority of human diseases, and those which afflict the lower orders of animal life as well, have been brought under critical review in relation to the bacterial factors which may be concerned in their etiology. The field which has been so systematically cultivated has proved to be a surprisingly fruitful one. In no other department of medical science have the discoveries been so numerous or so brilliant; one characteristic result of which has been the general attitude of mind which this great forward step in medical progress has produced, not only upon those medically educated but among the laity as well—viz, the expectation and belief that all the ills to which flesh is heir are caused by disease-producing germs. Somewhere in his "Practice of Medicine," Sir Wm. Osler says in effect that, paradoxical as it may seem, very few persons ultimately die from the diseases from which they have suffered for a large portion of their lives; in which point of view he recognizes the long category of ailments due to inherited defects of tissue and tissue organization, and to errors in the nutritional process that in themselves are disease conditions, which inhibit the defensive forces of the body, lower the vital resistance, and make possible the bacterial invasions that later carry off the patient with a secondary acute attack of fatal disease.

The malnutritional states arising from the above-mentioned causes, acting as antecedents to or precursors of later terminal infections, constitute a wide and important field of pathological study which finds many examples in the domain of dental and oral investigation. In the "American System of Dentistry" by Litch, Prof. A. P. Brubaker has set forth the records of a long array of cases in which bacterial action plays no necessary or evident rôle;—cases of reflex nervous action arising from long-continued mild irritation of the terminals of the dental branches of the trigeminus in and about the teeth. Search through the issues of the Dental Cosmos has brought to light records of over 1200 cases similar to those related by Brubaker, in which serious functional disturbance and even profound nervous derangement have resulted from peripheral dental irritation wholly physical in character. The late Henry S. Upson at the suggestion of a dental colleague undertook the investigation of this subject, and reported in his widely read "Insomnia and Nerve Strain" some of his clinical findings, and particularly the relief obtained in epilepsy, chorea, and even dementia præcox, by eliminating the sources of peripheral dental irritation by means of appropriate operation.

The general facts related to this special field of dental pathology have been more or less familiar to the dental profession for many years. The phenomena of pathological dentition as manifested in the teething infant are characteristic of interferences with the dentitional process in its early manifestations. We have, however, overlooked the general fact that the dentitional process is a process which begins at birth and is not completed until and after the eruption of all of the third molars of the permanent denture, normally about the eighteenth year—although interferences with the process of dentition may delay it much beyond the normal period for its completion, so that in abnormal cases the individual may be "teething" at any period of life.

Abnormality of the dentitional process invariably means more or less reflex nervous disturbance, and because of the protean activities and diverse functions related to or controlled by the fifth cranial nerve, terminal irritations of its dental branches may be manifested in the most protean nervous reactions. The Henry S. Upson Commission, composed of a group of medical and dental specialists, invite reports of cases from the dental profession to aid them in their study of these dental reflex phenomena and their investigation of the underlying causes thereof.

Such reports will be gratefully received by the Commission, and may be forwarded to the Editor of the Dental Cosmos.

BIBLIOGRAPHICAL

Essentials of Operative Dentistry. By W. Clyde Davis, M.D., D.D.S. Second Revised Edition. Octavo, 334 pages, 180 illustrations. St. Louis, Mo.: C. V. Mosby Co., 1916.

In presenting the first edition of this text-book the author's stated aim was to meet a demand in dental college work for a treatise on operative dentistry sufficiently condensed to enable the student to master its contents in the comparatively short college term at his disposal. While the new edition is prepared along the same lines as its predecessor, it is nevertheless enlarged to cover a wider field. Four new chapters have been added, others enlarged, and certain portions have been entirely eliminated.

The author gives as a definition of operative dentistry—"That branch of dentistry which treats of the mechanical procedures performed within the oral cavity looking to the salvage of the teeth." That he considers this definition an elastic one is evidenced by his inclusion of a chapter devoted to the extraction of permanent teeth, which operation would doubtless be claimed by the oral surgeon as one to come under *his* care.

Dr. Davis modestly "claims little originality in the essentials presented" in his work, but those who have followed this teacher's professional career during the past decade will, we think, recognize many points that have been originated and brought out by the author during that time. However, the book follows very closely the nomenclature and the methods of operative procedure used by the late Dr. G. V. Black in his writings, and these have already received such analysis as to make a further reviewing wholly unnecessary.

We are glad to see the author's reference in chapter XVIII, under the caption "Toilet of the Cavity for Gold Inlays," to the fact that herein lies the greatest weakness in inlay methods. He says: "No cavity margin is surgically clean after it has been moistened or been in contact with the inlay wax pattern. After the pattern has been formed and removed, our methods will not permit of again planing the cavity surfaces, and particularly the margins, which is the only way to render them entirely clean. Hence we are forced, just before setting the inlay, to wash the cavity walls with solvents of the substances which have contaminated them." He then advises that the cavity be thoroughly scrubbed with chloroform, then absolute alcohol as a second cavity toilet, and immediately the cavity be flowed with the cement, introducing the inlay under dry conditions. The reviewer has long recognized the difficulty pointed out by the author, and to overcome it so far as possible has used the chloroform and alcohol to dissolve foreign particles. We are still confronted, however, with the film left after the evaporation of the absolute (?) alcohol, and our own method is to give the margins a series of wipings, or rubbings, with some soft substance. Cotton and bibulous paper were found to leave particles, often too small to be detected; therefore tiny squares of linen were adopted. It is doubtful, in our opinion, if any foreign substance in sufficient quantity to interfere with a perfect sealing of the cavity can be found after margins have been so treated.

Chapter XXIII treats very thoroughly of the manipulation of amalgam in the making of a filling. As the book is primarily for the student, we feel that the writer might have considerably extended the paragraph headed "Cavity Preparation for Amalgam," particularly in view of the fact that he says, "The preparation of a cavity for the reception of amalgam is even more exacting than for gold." On page 142 the author, speaking of separation, says: "Preliminary or immediate separation is just as essential in the use of amalgam as gold." We thoroughly agree with the statement so far as it applies to *preliminary* separation of teeth having approximal cavities to be filled with amalgam. But we think few will concur in the suggestion to use *immediate* separation when the filling material is one requiring considerable time for hardening.

The subject of silicate fillings is thoroughly and scientifically treated. Dr. Davis has done much original work with the material, and is thus in a position to speak authoritatively. In alluding to resistance form in cavities intended for silicate fillings he calls attention to the fact that, owing to the friability of the filling material the cavity outline should be laid on areas subjected to least stress, in order that both the weak enamel margins and the filling margins may be protected. In discussing a recent paper by the author we made reference to our own method of handling this problem, viz: After a general form is given the cavity, the patient is directed to occlude with carbon paper interposed, when, the points of contact being shown, the future preparation of the cavity is determined by extending the margins either short of or beyond the marks made by the carbon paper.

In an appendix the author submits a series of operative and dental anatomy technic courses for dental schools, based upon his book and a four-year curriculum.

The presswork is excellent, and fully up to the standard now expected of the firm of publishers who present the book. But—as in reviewing another work from the same press—we must here note the incongruity of the term "second revised edition." All editions are revised, otherwise they are simply *reprints;* while "second revised edition" implies that there had once been a "first revised edition."

A. P. L.

THE AMERICAN YEAR-BOOK OF ANESTHESIA AND ANALGESIA. By Various Contributors. F. H. McMECHAN, A.M., M.D., Editor. Quarto, art buckram; India-tint paper, 420 pages and 250 illustrations. Surgery Publishing Company, 92 William st., New York City, 1916. Price $4.00.

The problem of the elimination of pain, particularly the pain incident to surgical procedures, has occupied the thought of humanity and the attention of investigators since man's recorded history. The discovery of surgical anesthesia in the latter half of the nineteenth century marked the first important step from the unknown into the region of the known in this field of inquiry, since which time no department of pharmacology and therapeutics has been more assiduously cultivated; and especially in recent times, in no other department of medicine have the advances in scientific knowledge been more rapid, nor has investigation been more prolific.

The induction of surgical anesthesia without the loss of consciousness has marked another and fundamentally important step in our knowledge of the anesthetic procedure. A large number of drugs now available for the induction of anesthesia in localized areas and the scientific study of their mode of application and of their relative safety or otherwise, their pharmacological characteristics as well as the utilization of the older general anesthetic substances for the induction of analgesia and anociassociation, have collectively brought into being a vast literature, so vast that unless one definitely specializes in this field of inquiry it becomes humanly impossible to keep in touch with all the progress that is being made in the study of anesthetics.

"The American Year-book of Anesthesia and Analgesia" is a masterly attempt to collate and render easily accessible the cream of the literature relating to the development of our knowledge of anesthesia during the previous year. Such attempts are not always crowned with satisfactory results. In the present case, however, the intelligent and enthusiastic work of the editor has produced a volume within the pages of which are embraced the essential and therefore most important advances made in the study of anesthesia during the period with which it deals, and the result is a work which must be regarded as an indispensable reference and guide-book to every student of the subject. A copy of this important work should be in the library of every progressive practitioner.

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REVIEW OF CURRENT DENTAL LITERATURE

[*Journal of the American Medical Association,* January 20, 1917.]

A Clinico-pathologic Study of Early Malignant Conditions of the Face and Mouth. BY JOHN W. MEANS AND JONATHAN FORMAN.

The majority of the so-called precancerous lesions represent an incomplete or perverted reaction to some form of chronic irritation. About the face and mouth, carcinoma arises from one of three types of cell:

(1) The squamous epithelium of the skin and mucosa, giving rise to the epidermoid carcinoma or epithelioma.

(2) The cell of the hair follicle, giving rise to the hair-matrix carcinoma or the often erroneously called basal cell carcinoma.

(3) The epithelium of the glands associated with the skin and mucosa, giving rise to the various types of glandular carcinoma—relatively rare.

The most frequent tumor of this region is the epidermoid or squamous cell carcinoma.

In the 22 carcinomas of the face occurring above the line of the lower lip in the series which forms the basis of this study, 12 were of the hair-matrix variety. In larger series the proportion of this type is usually greater.

The connective tissue lesions occurring on the alveolar border form an interesting group of tumors usually referred to as epulids. The soft or giant cell variety is the one about which wages the controversy as to malignancy. The prognosis of giant cell epulis, in general, is good, provided careful excision has been made. The treatment should consist in a complete removal of the tumor and its point of origin.

Sarcoma is a common tumor of the jaw. These growths should be excised well beyond the line of visible infiltration. If metastasis has already begun, the case is hopeless.

If further headway is to be gained against cancer of the face and mouth, it must be by the education of the dentist, physician, and laity, urging the prompt radical treatment of cancer while it is still a local process.

[*Annali di Odontologia*, Rome, December 1916.]

The Denture in Basedow's Disease (Exophthalmic Goiter). By GUGLIELMO BILANCIONI.

Bilancioni has collected records of twelve cases of exophthalmic goiter in which there was marked dentitional disturbance. Four cases, in his own experience, he reports in detail. These were accompanied by a rapid loss of all or of most of the teeth. There was resorption of the alveoli and of the maxillary margin. The pathogenic causal relation existing between Basedow's disease and the dental degenerations he attempts to ascribe to three factors:

(1) Dystrophic, possibly analogous to similar symptoms so characteristic in cases of tabes dorsalis.

(2) An interference with the calcium metabolism; this factor Bilancioni keeps distinct from (1).

(3) Gastric and intestinal disturbances. The pre-existence or co-existence of pyorrhea alveolaris would accelerate the pathological influences of the above systemic factors.

[*Journal of the American Medical Association*, January 13, 1917.]

Bismuth Poisoning Following Bismuth Paste Injection. By ELLIS B. FREILICH.

This article is of interest to the dentist because the individual's sensitivity to this toxic agent makes its early and unmistakable manifestation at the gingival margin. In the case reported 2½ ounces of bismuth paste were injected into an abscess in the left hip. Eight days later the patient complained of soreness of the gums and tongue. Examination showed a line of bluish black pigmentation about 2 to 3 mm. in width along the border of the gum adjacent to the teeth in both jaws; the tongue was swollen. The pigmentation extended along the under surface of the tongue, following the course of the ranine veins. On the buccal mucosa were discrete as well as confluent spots of a similar character. The glossitis and gingivitis became more severe; salivation was very pronounced.

[*Journal of the Allied Dental Societies*, December 1916.]

Vaccines in Pyorrhea. By ARTHUR H. MERRITT.

This is a philosophical consideration, and does not contain concrete case histories or experimental evidence. However, it well and briefly summarizes the present status of expert opinion upon the validity of the use of vaccines in pyorrhea alveolaris.

There are but three conditions which would justify the employment of vaccines in this connection: (1) If the disease were caused by bacteria, (2) if the inoculation of vaccines cures or permanently improves it, and (3) if no simpler or more efficient form of treatment is available.

Pyorrhea is not caused by a specific organism or group of organisms. Vaccines of themselves neither permanently improve nor cure pyorrhea, and cases which have not yielded to surgical treatment cannot then be cured by their supplemental use. There is no trustworthy evidence that the combined surgical and vaccine treatment of pyorrhea expedites or increases the percentage of cures. A far more simple, effective, and expeditious form of treatment—instrumentation—is in use by which any curable case of pyorrhea can be cured without resort to other treatment. The above succinctly disposes of the three conditions.

In metastatic infections from pyorrhea, cultures taken from the pyorrheal focus may be of value in treating the secondary infection.

The criterion of a cure in pyorrhea is the actual reattachment of the soft tissues to the cementum of the affected tooth, which reattachment will not occur if the tooth be not vital.

[*Lancet*, London, January 6, 1917.]

Dentifrices: Report of the *Lancet* Laboratory.

The purpose of this study is only to show the chief points in regard to the composition and character of the dentifrices which find public patronage.

Nineteen samples were purchased in the open market, 7 powders, 8 pastes, 2 solid soaps, and 2 clear fluids. The last class appears to be less in public favor because it lacks a mechanical agent (detergent).

The requisites are that the dentifrice be germicidal, antifermentative, deodorant, antacid, and a mechanical detergent. Although the *Lancet* report warns that "a dentifrice may clearly do more harm than good," it fails to particularize that the supreme requirement of a dentifrice is a negative one—namely, that it should do no harm, *e.g.* inhibition or alteration of normal salivation—and that in following this dictum the most we can expect of a dentifrice is that it be a mechanical cleanser.

Chalk seems preferable to other detergents, *e.g.* silicious substances, because it acts not only mechanically but also as an antacid. Its quality, *i.e.* its state of comminution, was not in all cases uniform in the samples examined. The popular antiseptics were thymol, phenol, hydrogen dioxid, benzoic acid, wintergreen, mint oils, and cinnamon.

All the dry powders contained chalk, varying from 32 to 88 per cent. The pastes showed in general a wider range of composition than did the other preparations; on the whole, the chalk present was in a much better state of comminution than in the dry powders. The presence of hydrolyzable carbohydrates—glucose, saccharose, and starch—is open to objection.

The soaps were commonly combined with chalk and phenol or the essential oils. No mention is made that soap in too high percentage markedly decreases the flow of saliva.

The fluids consisted generally of solutions of essential oils in alcohol.

A table giving the qualitative and in part quantitative data of these 19 preparations is appended. It records the percentages of moisture, ash, insoluble ash—chiefly chalk—soluble alkali as Na_2O, and alcoholic extract—chiefly soap and glycerin; also it gives the microscopical observations and antiseptic agents.

This report well exhibits the current wide departure from uniformity and standardization in the compounding of dentifrices, which seems lamentably whimsical and empirical.

[*Dental Review*, February 1917.]

Some of the Present Tendencies in Operative Dentistry. By C. N. Johnson.

The first tendency noted by Johnson is the striving for the prevention of disease. In so far as this applies to the elimination of dental caries, it will remain unachieved until the question of susceptibility and immunity to this devastating lesion has been solved. In the meantime thorough cleanliness of oral structures must suffice.

Johnson feels that the chief benefit of the practice of oral prophylaxis is to the gums and supporting structures, and that even this benefit is more or less temporary unless the patient can be induced to give heartily and seriously daily care to the teeth and gums. This in itself is of greater significance in the prevention of disease than anything the dentist can do; and at the same time there is no more useful service we can render the patient than the careful removal of calcific deposits and smoothing the surface of the tooth so that reattachment of the pericemental ligament will take place.

A further phase of this preventive tendency is the maintenance of the function of mastication with comfort and satisfaction to the patient. Without this function adequately performed there is no assurance of freedom from disease no matter what kind of prophylaxis is performed. No mouth can very long be free from either caries or pyorrhea in which the contact points are such that fibrous food constantly leaks between the teeth and lodges there.

In this respect compare an article by H. J. Morris, "The Closing Bite," in the *British Dental Journal* for February 1, 1917, page 84.

In a practical way the most outstanding recent development of the subject of filling materials seems to be the growing importance of the silicate cements. With proper recognition of their limitations they will prove a very acceptable adjunct to our filling armamentarium, and we may confidently look for even greater improvement in their manufacture in the near future, to the end that they may be more permanent.

Probably the one subject more prominently before the profession than any other at the present time is the one of metastatic infection connected with pulpless teeth. This subject Johnson in brief discusses most carefully, broadly, and sanely. He believes that the conscientious dentist can be depended upon to produce work free from all such dangers.

He welcomes this doctrine of the oral foci of infection as the means of awakening the general medical practitioner to a somewhat adequate realization of the importance of the teeth and mouth: but wisely and emphatically Johnson insists that the dentist alone must be made capable of passing final judgment as to whether or not a tooth may be saved without prejudicing the health of the patient.

In this connection should be noted a similar protest (Anders, *Journal American Medical Association*, Feb. 17, 1917, p. 567) against myopic orders of wholesale unwarranted extraction from the medical man.

It is to be hoped, and not at all without great likelihood of realization, that the present agitation upon oral infectious foci is a symbol and a promise of a closer, more sympathetic, and more intelligent co-operation between the dental and the general practitioner. This tendency, still in its infancy, will prove of monumental significance in the historical development of dentistry.

[*New York Medical Journal*, January 20, 1917.]

Differential Roentgen Diagnoses in Bone Diseases. By Russel H. Boggs.

In no other field has roentgenology proved more helpful than in pathological osteology. The roentgenographs not only show the surface and outlines of the bones, but also dislocations and enlargements, the architecture within the bones as well as the histology and chemical state.

In interpreting radiographs the following points must be considered: (1) history, (2) physical signs, (3) evidence of disease, tuberculosis, or tumor in other parts of the body.

Each roentgenologist should interpret his own plates, in default of a standardized technique in making bone plates.

Boggs' present purpose is to consider only four or five of the more common bone diseases, excluding the rarer infections such as osteomalacia, osteitis deformans, etc.

In tuberculosis the roentgenograph shows bone atrophy or rarefaction, bone destruction, sequestra, and abscess formation. When the disease is of a few months' duration one or more of these are always present; it should be realized that they may be caused by other diseases. The typical roentgenograph of tuberculous osteitis shows atrophy, one or more areas of bone destruction, and a hazy or foggy appearance. The clinical symptoms are pain, spasm of the muscles, and great tenderness.

In the differential diagnosis of bone tuberculosis by Roentgen rays we note the following points: In syphilis the bone is porous instead of translucent, and the periosteum and cortex are denser, and wavy in outline. The diagnosis between osteomyelitis and tuberculosis by Roentgen rays is often difficult, but osteomyelitis does not produce bone atrophy, and there is a periosteal overgrowth which is not present in tuberculosis. In bone cyst there is a clear space, but bone atrophy is lacking.

Osteomyelitis, in the early stage, usually cannot be detected by the Roentgen rays. The earliest Roentgen-ray appearance is a slight increase in periosteal shadows at one or more places and a definite swelling of the soft parts. After from six to eight weeks' duration the bony changes usually give a very characteristic picture—alternating dark and light areas with rarefaction, showing a softening and loss of lime salts.

Sarcoma is the most common tumor of the bone. In the early stages it cannot be diagnosed radiographically from a simple inflammatory process. Endosteal sarcoma causes absorption of the bone from within, following expansion, and at the same time osseous deposits on the under surface of the periosteum. A more or less honeycombed appearance may occur on the roentgenograph.

Periosteal sarcoma is the most difficult type to diagnose by X-rays, but as soon as the periosteum shows thickening dense enough to cast a shadow, it can be shown on the plate. The soft parts are involved, and usually are of sufficient density to cast a shadow.

Syphilis of bone shows usually characteristic roentgenographs in several ways. Possibly the most common manifestation is periosteitis. There is lamellation of the periosteum, running parallel to the cortical line of the bone. When periosteal bone occurs there may be new endosteal bone formation, partially obliterating the medullary cavity. Gumma may appear either in the form of a circumscribed periosteitis, causing round nodes and sometimes softening or breaking down, or may begin in the marrow or spongy parts of the bone. The mouse-eaten or mosslike appearance of the periosteum is very characteristic. The gummatous infection of bones, if localized, shows erosion and rarefaction of a limited area, with new periosteal bone formation on each side of the affected area.

Carcinoma of bone is secondary to a growth elsewhere in the body. Usually it follows the scirrhous type. On the plate it changes appearance as irregular shadows of varying density, lighter than normal bone. In some cases the disease takes the form of necrosis, when the cavities are filled with necrotic tissue, and appear as lighter areas on the plate.

[*Journal of the American Medical Association*, January 20, 1917.]

Ankylosis of the Jaws. By CHALMERS J. LYONS.

Lyons confines his attention to intra-articular bony ankylosis, or true ankylosis. The intricacy of the temporo-mandibular articulation makes far more difficult any inquiry into an affection of this joint than would be conditioned by the same lesion involving a less complex joint.

Sex seems to have no influence here as a predisposing cause. The predisposing age is from one to ten years—explaining the frequent accompanying facial deformity. The primary causes seem to be traumatism and infection. Lyons' own observation is that trauma has been at least the primary cause in by far the larger number of cases. The infections are scarlet fever, otitis media, dento-alveolar abscesses, diphtheria, and gonorrhea. The onset and development of ankylosis is very insidious; several years are required to produce lesions of any considerable extent.

The differential diagnosis is not a complex problem. In fibrous ankylosis there will be some movement, especially lateral, of the jaws. In bony ankylosis, the only movement observable is the very limited movement of the elasticity of the structures involved. There can be no lateral movement of the mandible in the intra-articular bony ankylosis.

The treatment consists in surgical measures, establishing a pseudo-arthrosis either in the true joint or below it. Lyon has been very successful with an operation in which a section of bone is removed from the condyle. The details of this operation are given. After about 5 days the treatment consists in stretching the jaws by a graduated mouth-gag, for a period of several weeks. Infection is one of the greatest dangers subsequent to this operation; other dangers are the inability of the anesthetist to control the tongue, injury to the temporal rami of the seventh nerve, and to the internal maxillary artery. The patient begins mastication in about ten days or two weeks following the operation.

[*Dental Review*, Chicago, February 1917.]

Thoughts on Modern Dentistry. By SYDNEY J. KNOWLES.

Under this title is hidden a method of making a bandless crown. Knowles in a number of paragraphs shows his appreciation of the close interrelationship between the oral cavity and the rest of the system. He lays some stress upon the dangers of traumatic insult—in particular the projecting edge of a banded crown—to the gingival tissue. Impressed with such thoughts, it has been Knowles' practice for the last nine years to use practically no banded crowns at all, during which time he has substituted a bandless crown which has proved far more satisfactory.

A method and the technique for perfectly fitting or adapting metal well reinforced to the surfaces of an irregular molar root is his original contribution in this paper.

If not enough tooth structure be left to restore satisfactorily a tooth with a gold inlay, he grinds the remaining pieces down to or slightly below the gum margin. Then the root-canals are prepared for 16- or 18-gage square iridio-platinum posts. An impression is taken of the root by first packing the prepared root-canals with cotton to prevent impression materials from being forced into them, using a cube of Kerr's Detroit modeling compound which is slightly larger than the root outline, softening a thin layer of the compound on the surface, using a flame. The compound cube, if pressed over the root and held firmly in place and chilled with ice-water, will usually result in a very perfect impression, showing a well-defined outline of the root. This method is preferable to any of the band-matrix methods for obtaining an impression, and very much easier on the gums and soft tissues of the patient.

Embed the compound impression in a small pad of plaster to support it. When the plaster hardens, a putty-like mixture of Ames' brown crown and bridge cement rolled in talcum powder is firmly forced with one's fingers down over the impression, using a great deal of pressure. The cement and impression are immediately placed in tepid water to assist the proper setting of the cement, which, when hard, is separated from the impression by heating in hot water. The cement model is embedded in plaster held in a metal ring that will fit a Brewster rubber plunger swaging machine.

Over the cement model is swaged a piece of platinum foil 1/1000 inch thick, leaving a surplus of about ⅛ inch. The second step is to swage a second piece of platinum 1/1000 inch on top of the first and trimmed to overlap only 1/16 inch. On top of these two layers of platinum foil 36-gage pure platinum plate is swaged, and trimmed exactly to the root outline. These three layers are then soldered together. The surplus of platinum foil is trimmed and disked off, giving a strong and rigid metal covering for the end of the root.

By this method it is possible to obtain a perfectly adapted coping, and one that is rigid enough to prevent distortion in the subsequent handling in the fusing and building-on the porcelain top.

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PERISCOPE

To Give a Facing a Light Gray or Blue Shade.—To give a facing the light gray or blue shade at the tip when the body and the gingival portion should be of the yellow shade, is very easily accomplished by laying a piece of 1/1000 platinum foil between the facing and the gold backing in the incisal third. Thus the reflection becomes a grayish color which would otherwise have been yellowish, due to the presence of the gold.—F. W. Brahm, *Pacific Dental Gazette.*

Use of the Snow Face-bow.—With the waxes in position, the bite-fork is warmed and inserted with the stem at the median line. This may be done with the wax outside of the mouth if preferred. The fork stem should be placed on a line parallel with the plane of occlusion. The face-bow is then placed in position with the lock-nut loosely affixed upon the stem of the bite-fork. The lateral movable rods are then adjusted upon the position, on each side of the face, of the temporo-mandibular articulation. These points should either be predetermined and marked upon the face or, for all practical purposes, placed one-fourth of an inch anterior to the tragus of the ear on a line with the outer canthus of the eye. These rods are marked with equidistant gradations, and should be adjusted evenly on both sides, and firmly secured by set-screws. The set-screw upon the stem of the bite-fork should then be firmly secured. The bite waxes, with the face-bow attached, may now be removed from the mouth. The Snow articulator is provided with lateral projections for the reception of the movable rods of the face-bow.—Ellison Hillyer, *Dominion Dental Journal.*

Swallowing a Toothbrush.—An extraordinary case of a hospital patient swallowing a toothbrush was inquired into at the Hackney Coroner's Court recently. The deceased, Solomon Barnett, forty-nine, a gasfitter, of Bethnal Green, went to the German Hospital complaining of rheumatism. One morning he told the nurse that he had swallowed a toothbrush. X-rays yielded nothing. After his death an examination revealed the toothbrush embedded in the soft tissues of the gullet. The handle was of celluloid and did not give a shadow under the X-rays.—*Brit. Journ. of Dental Science.*

Effects of Malocclusion on the Tooth Attachment.—The tooth in malocclusion is generally the victim of undue lateral stress, great in amount and frequently repeated. The effect on the lateral walls of the alveolus is felt first by the peridental membrane, and then by the osseous tissue. The result is the stretching of the peridental membrane, straining attachments, disturbing bloodvessels, cramping nerve lines, and finally the partial or complete absorption of the lateral walls of the alveolus.—ALBERT F. LINSCOTT, *Dental Summary.*

The Partial-plate Denture.—One of the most neglected departments of prosthetic dentistry is the partial plate. It seems to me that this form of denture offers the best transition between the safe and sane and the unsafe and insane. There are innumerable methods of attachment, and one can use almost any of these that are applicable in bridge work, and any combination of such devices. I have always been a strong advocate of the clasp. This method has largely gone out of use, as these attachments were originally made, though as a means of attachment to live teeth where conditions are unfavorable to shell crowns, etc., it presents wonderful opportunities. Fixed clasps are often undesirable, but jointed clasps having oscillating movement leave the teeth capable of making every movement with the denture in the mouth that is possible without it.—NORMAN S. ESSIG, *Dental Items of Interest.*

Roentgenography and Dental Pathology.—I have lately been impressed with the condition known as the darkened area in roentgen skiagraphs, not only from the work that I have had done, but on account of reviewing the work of others. It was not until probably four years ago that I was impressed with the mistakes I had made in reading radiographs. At that time, whenever a darkened area was seen around the apex of a root of a tooth I assumed that it meant the presence of an abscess. But when radiographs were made of fractures of the mandible in which a well-defined line of fracture was seen and for which splints were used, the fragments being readjusted, the normal occlusion of the teeth restored, and then another skiagraph of the same bone at the same place, made six or eight weeks later, I found exactly the same appearance as when the first skiagraph was made, and concluded, that a fracture still existed. The newly-formed bone was not sufficiently dense in structure, not sufficiently ossified to present the same appearance that the normal older bone did, and so was misleading. Leaving the splints on for five or six weeks longer and again making a roentgen skiagraph, a well-defined line at the fracture was found; but feeling satisfied that the bone had united, the splints were removed and it was found that the bone had firmly united and was all right, yet at that time it showed exactly the same condition that it did when the first skiagraph was made. This led me to believe that I had been making mistakes regarding the darkened areas at the ends of the roots of teeth.

Now I am convinced that these darkened areas we see on the plate are by no means evidence of an abscess. They are evidence, however, that an abscess once existed, that the bone was destroyed or absorbed by pressure, and that perhaps there was infection of the organic matter of the bone to such an extent that some of the bone itself became disintegrated. In some instances we all know a great deal of the bone will become disintegrated, and large cavities will be left at the ends of the roots of the teeth; but these large cavities, everything being done to exclude further infection by having the root well defined, will be filled by the new bone.—T. W. BROPHY, *Am. Journ. of Roentgenology.*

Plaster of Paris.—Good plaster of Paris, when well matured and in the fittest condition for use, varies greatly in strength, according to the quantity of water with which it is mixed, *e.g.:*

1 lb. of plaster to 9 oz water, mixed quickly and well, will stand a breaking strain of 600 lb. to the square inch.

To 11 oz water: Breaking strain 450 lb.
To 13 oz water: Breaking strain 300 lb.
To 16 oz water: Breaking strain 50 lb.

When plaster of Paris sets too quickly for comfortable use, it is too new; in other words, it has not been allowed to mature by the manufacturer before being sold. It can be made to set more slowly by spreading out each lot upon a large piece of paper for an hour or so before it is required.

When plaster of Paris is old and sets slowly, it should be mixed with less water than usual.

The colder the water used for mixing plaster of Paris, the more slowly it will set.

The older plaster of Paris is, the more slowly it will set.

Plaster of Paris kept in a damp place soon perishes.

Due allowance must be made for the varying behavior of plaster of Paris due to changes of weather.

Plaster of Paris stored in a dry place will keep good for months.—*Ash's Monthly.*

To Solder the Dowel Pin to the Floor of a Crown Coping.—In a band or partial band cope for a crown, time may be gained if instead of investing the cope, a bit of asbestos fiber is made wet and carefully shaped with the fingers to the pin and floor on the surfaces to be in contact with the root. Then heat, and as the water evaporates, the asbestos becomes quite dense, and holds the relation correctly when the pin and floor are united, the whole operation requiring but one or two minutes.—J. F. F. WALTZ, *Dental Review.*

Difficulties in Sealing Root-canals.—If root-canals were straight from pulp chamber to apex and approximately round, of gradually increasing diameter from apex to floor of pulp chamber, the filling of canals would be an exceedingly simple matter. Pushing or packing warm gutta-percha after the introduction of a gutta-percha solvent in sufficient amount to smear the walls of the canal would meet the requirements.

A very small proportion of root-canals are of the outlines mentioned. As is well known to dentists, most canals are thin flat channels following a devious course through a tubular substance, the dentin; finally, in the apical third of the roots, they break up into two or more fine branching canals leading to from one to nine foramina. We believe that to fill or seal the dentinal tubuli, the collateral or branching canals are of equal importance as the filling of the main root-canal. Experimental work shows that *direct packing* of the filling material into the canal does not cause it to enter the tubuli, nor does the filling enter the smaller of the branching canals under direct pressure. The *pumping* motion so often described does send the filling solution into both tubuli and collateral canals.—J. R. CALLAHAN, *Journ. N. D. A.*

The Error of Condensing Amalgam Fillings.—Of late years there has been a tendency to regard amalgam as a substance to be manipulated in much the same manner as is gold foil—that is, to strongly compress it as it is being packed into the tooth cavity; then, when the filling has been built up to its required dimensions, to use a very large, broad-faced amalgam plugger that will cover as much as possible of the outer surface of the filling, and by the application of all of the energy that the filling will stand, force the plugger down and so "condense" the filling.

In order to properly appraise the value of such a procedure, it is only necessary to compare the physical characteristics of the two widely different materials, gold foil and amalgam. In gold foil we have a substance that is in a state of relaxation and is inherently soft, and therefore capable of being compressed under a plugger as each successive layer is placed in position. In the unappropriated alloy content of dental amalgam, however, we have a substance that cannot be compressed by any force that the dentist can exert on a filling.

Thus, while gold will flow under a comparatively insignificant pressure, a recent test of the amalgam alloy Ag_2SnCu developed a resistance of over 120,000 lb. to the square inch, truly a compressive strength that even a dentist cannot hope to overcome with only his "good right arm" and a broad-faced plugger. Pure gold foil unites or welds under pressure as the result of the force of molecular cohesion, this becoming operative through the transmission of external energy. An amalgam, on the contrary, unites as the result of the operation of the force of crystalline adhesion, which latter force is operative only after the molecules of amalgam or other alloys have been built up into the form of crystals, as the result of the operation of certain forces of chemical and physical attraction.

Crystalline adhesion requires contact of the planes of the crystals, but strong compression is not necessary to secure this contact, for the force of crystalline adhesion is automatically exercised where the amalgam paste has been spatulated or burnished into place in the tooth cavity as a filling. Gold, after compression, is in a state of comparative equilibrium of volume, which is only disturbed by such thermal changes as occur in the human mouth, and moreover, there are no chemical reactions occurring within it nor such a physical phenomenon as diffusion. Amalgam, on the contrary, is not in volume equilibrium until its mercury content has, by osmotic pressure, diffused through the mass and its every particle has gone into chemical combination with the molecules of the contained alloy, thus forming crystals of definite composition and fixed physical properties.

From this it can be seen that however strongly an amalgam filling has been compressed, it is certain that the hoped-for condensation, which in effect has resulted in setting up internal strains and in driving a portion of the mercury to the margins of the filling, will be completely nullified by the internal motion caused by the operation of natural laws which govern all the phenomena of alloying.—W. W. ATKINSON, *N. J. Dental Journal.*

HINTS, QUERIES, AND COMMENTS

A Quick Emergency Repair.

I HAVE never seen this "stunt" in print, while no doubt it is old to many; yet the idea may be new to some. It will sometimes be found a valuable aid in an emergency case.

A patient having lost a tooth in the front of the mouth, wanted something done immediately, as she had an important engagement that day. My time was all engaged for several days; however, I selected a vulcanite plate tooth from my tooth cabinet, took a couple of pieces of regulating wire and twisted one around each pin of the tooth, warmed some gutta-percha and pressed it over the heads of the pins and wire, and fitted the tooth into the space of the missing one, and ligated it to the tooth on each side. The patient wore the tooth for several days, until I could find time for a permanent repair.

The whole procedure took about five minutes.

RALPH W. BABCOCK, D.D.S.

New York, N. Y.

Scotch Oat-cake: A Query.

WILL someone tell us how to make the Scotch oat-cake?

I am under the impression that this is an ideal food, especially for children. Being hard and dry, it cannot be gulped without being insalivated, as can oatmeal mush. Though hard as compared with mush or with the American cracker, it is not too hard to break with the teeth, but somewhat brittle, being cooked in sheets about one-sixth inch thick, and just sufficiently hard to develop a child's teeth and jaws. As I remember it, the taste was much more pleasant than that of oatmeal mush ("porridge")—for which I never developed a liking, while I ate the oat-cake with pleasure. It was baked by my old Scotch grandfather, who died when I was but seven years of age, and then its creation became a lost art in our household. Can anyone give the recipe?

STEWART J. SPENCE.

Chattanooga, Tenn.

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OBITUARY

Dr. James Grant Lane.

[SEE FRONTISPIECE.]

DIED, from the effects of inhaling gasoline fumes, near his home, 1727 Memorial ave., Philadelphia, Pa., on February 4, 1917, JAMES GRANT LANE, D.D.S., in his fifty-first year.

The night being cold, Dr. Lane had gone to his private garage, a short distance away, to take precautions against the freezing of the water in the radiator of his automobile. Some hours later Mrs. Lane awoke, to find her husband not returned. She went to the garage, found it locked, but through a mailing orifice in the door could see the body of her husband lying under the car. Officers who assisted her in gaining entrance had the body taken to the Presbyterian Hospital, where it was stated he had been dead for some time. From the position in which the body was found it is believed that Dr. Lane had attempted to make some slight repairs to the car's mechanism, and the deadly gas lying close to the floor, he was thus rendered unconscious, death following apparently without a struggle. The coroner's jury rendered a verdict of accidental death from petromortis.

Dr. Lane was born April 12, 1866, on a farm near Shirleysburg, Huntingdon county, Pa. His parents were the Rev. James R. Lane, a Dunkard bishop, and Catherine (Meyers) Lane. Dr. Lane received his early education in the public schools of his vicinity, after which he went to Juniata College, at Huntingdon. Following this, for a time he worked in the office of Dr. Thomas Rhodes of Cora, Pa.; then he entered the dental department of the University of Pennsylvania, being graduated therefrom in 1890. He was made a demonstrator of crown and bridge work in the same institution beginning with the session of 1892–93, and for over twenty-five years held various teaching positions with his alma mater, his final promotion there being to that of assistant professor of orthodontia. At the time of his death he was clinical professor of orthodontia at Hahnemann Medical College, having received that appointment during the session of 1915–16.

Upon graduation Dr. Lane opened an office on Powelton ave., near Thirty-eighth st., Philadelphia. Later he practiced and had his residence at 829 N. Fortieth st. Several years ago he opened offices in the Perry Building, Philadelphia, where he practiced up to the time of his death.

Dr. Lane was generally regarded as a "mechanical genius." His workshop, with its various lathes, machinery, and tools, was a source of wonder and admiration to all who visited it. When a case needed an appliance extraordinary, he manufactured it; if special tools or instruments were needed, they also were devised—all of which gave him a manipulative skill and a creative ability that has probably not been surpassed among his colleagues. Many appliances and instruments found in the dental depots bear his name, while he also contributed several valuable inventions to general mechanics. It was this love for creating the unusual that led him, doubtless, to take up as a specialty the science of orthodontia, which during the latter years of his practice he had brought to a remarkably successful standpoint.

His pen was a facile one, as his many contributions to the literature of his profession attest. It was in extemporaneous discussion, however, that he appeared to greatest advantage at dental meetings. He seemed to have the admirable faculty of viewing a subject from every possible angle, and, while generous, was also fearless; he seemed, too, to forget nothing in the way of detail. If he failed to debate upon a particular phase of the subject, it was because he knew nothing about it, and usually he said so.

When the Pennsylvania State Dental Society was reorganized several years ago on what has come to be known as the "Illinois plan," Dr. Lane was made chairman of the Committee on Reorganization, and the present strength and success of that society are largely due to his unselfish and untiring efforts to bring into its fold every component dental society in the state.

Dr. Lane was a member of the National Dental Association, Pennsylvania State Dental Society (past president), Pennsylvania Association of Dental Surgeons (past president), Academy of Stomatology, Odontographic Society of West Philadelphia (past president), Dental Alumni Association of the University of Pennsylvania (past president), Eastern Association of Graduates of the Angle School of Orthodontia, and Philadelphia Alumni Chapter of the Psi Omega Fraternity (P. G. M.). A great many other societies had elected him to honorary membership. He was a past master of Philadelphia Lodge, No. 72, F. and A. M., which body conducted services at the grave.

Because of his genial disposition James G. Lane numbered among his friends all those whom he had met during a busy lifetime of teaching, practicing, and society work. As a consequence his death came as a great shock and sorrow to a host of friends the country over. Those who were fortunate enough to be intimately and frequently associated with him suffer a loss that will always be keenly felt, for he occupied a place in their hearts that can never be filled by another.

Dr. Lane is survived by his wife, Mary Ellen (Bartholomew) Lane, formerly of Chester Valley, whom he married April 8, 1896, and by three daughters—Mary Bartholomew and Caroline Huddleson, age nineteen, and Helen, age sixteen.

Interment was made on February 8th at Great Valley Baptist Cemetery, Chester Valley, Pa. A. P. LEE.

Dr. Theodor S. Siqueland.

DIED, December 18, 1916, at his home in Brooklyn, N. Y., in his fifty-fifth year, of pernicious anemia, THEODOR SALVIN SIQUELAND, D.D.S.

The Second District Dental Society of Brooklyn adopted the following memorial record and resolution on the death of Dr. Siqueland:

Dr. Siqueland was born in 1862 in Stavanger, Norway, his father being a prominent physician of that city. He received his education in the schools of his native country, and came to America in his young manhood.

He came to New York in 1881 for the purpose of studying dentistry. He was a student in the office of Dr. Chas. D. Cook of Brooklyn for two years. He then entered the New York College of Dentistry, being graduated in 1888 with the degree of Doctor of Dental Surgery. The three following years he was assistant to Dr. A. R. Eaton of Elizabeth, N. J. In 1901 he married the daughter of Dr. Norman W. Kingsley, who was one of the founders and the first dean of the New York College of Dentistry. He began practice in President st., where he remained for twenty-three years, until in 1912 he removed his office to 67 Hanson Place.

Dr. Siqueland was one of the competent men of his profession, in which he took a distinguished place. He was an active member of the Second District Dental Society of Brooklyn, the Brooklyn Dental Society—of which he was secretary until his illness—the Dental Society of the State of New York, and the National Dental Association, in each of which he was a prominent member.

For twenty-five years Dr. Siqueland was a trustee and on the medical staff of the Norwegian Hospital as oral surgeon, in which capacity he rendered invaluable services to the community. He was a member of the Norwegian Club and the Brooklyn Civic Club.

Dr. Siqueland is survived by his wife, Alma Kingsley.

RESOLUTION.

Whereas, his beautiful character and sterling worth endeared him to all who knew him; therefore be it

RESOLVED, That in the death of Dr. Theodor Salvin Siqueland the Second District Dental Society of Brooklyn mourns the loss of a valued member.

FREDERICK A. NIES,
T. A. QUINLAN,
F. O. KRAEMER,
Committee.

"In Memoriam" Resolutions.

Dr. Gordon White.

THE Nashville Society of Dental Surgeons adopted the following resolution on the death of Dr. Gordon White:

Whereas, Almighty God in his infinite wisdom has seen fit to remove from the scene of his earthly labors our esteemed colleague Dr. Gordon White; and

Whereas, the Nashville Society of Dental Surgeons, of which he was an honored member, recognizing his great worth as a contributor to the scientific work of his profession, desires to record its appreciation of him as a man, and its sense of sorrow at his death; therefore be it

RESOLVED, That the members of this association extend to the family of the deceased their sincere sympathy in their bereavement, and that this resolution be spread upon the minutes of the Nashville Society of Dental Surgeons, and that it be forwarded to the dental journals for publication.

L. G. NOEL,
STANLEY RICH,
W. G. HUTCHINSON,
Committee.

SPECIAL NOTICE.

Preparedness League of American Dentists.

Headquarters—3 Professional Building, 131 Allen St., Buffalo, N. Y.

COMMITTEE ON ORGANIZATION.

J. W. Beach, Buffalo, *Chairman.*
H. A. Pullen, Buffalo, *Vice-chairman.*
M. B. Eshleman, Buffalo, *Sec'y-Treasurer.*

ADVISORY BOARD.

L. L. Barber, Toledo, O.
E. C. Kirk, Philadelphia, Pa.
H. E. Friesell, Pittsburgh, Pa.
S. D. Boak, Columbus Barracks.
H. L. Wheeler, New York, N. Y.

TRUSTEES.

H. J. Burkhart, Batavia, N. Y., *Chairman.*
T. P. Hinman, Atlanta, Ga.
Otto U. King, Huntington, Ind.
F. W. Low, Buffalo.
Truman W. Brophy, Chicago, Ill.

Our First Year.

By J. W. Beach, *Chairman*, Buffalo, N. Y.

The Preparedness League of American Dentists is now an established institution. Having just finished our first year we wish to acquaint the members of the League and the profession in general with some of the work we have accomplished.

The primary objects were twofold. First, that of preparing the mouths of applicants for enlistment who were rejected on account of defective teeth, and who were unable to pay for the necessary dental service to meet army requirements. We are proud to say that approximately fifteen hundred such applicants have thus far been cared for by members of the League throughout the country. Little publicity has been given to this fact, which explains the appearance of an article in the public press on March 14, 1917, from the National Security League reporting a letter to Dr. Otto U. King, secretary of the National Dental Association and a member of our board of trustees, asking him to engage the members of the association for this purpose. It is needless to say that as the Preparedness League is an auxiliary to the National body, this work will devolve upon the League to accomplish.

The second object, that of forming "sectional units" for the study of oral and dental war surgery, has met with hearty support by the profession the country over, and these clubs are now formed and being formed throughout the United States. Approximately twenty-five are now in operation. Every progressive dentist, even though an oral surgeon, should become affiliated with one of these organizations. We earnestly solicit correspondence with that end in view from all who have not already joined. It is needless to enlarge upon the importance of this particular object of our League, further than to add that this movement will become the greatest unifying agency our profession has ever known, and therefore it is our individual duty to give it support and to derive the fullest benefits therefrom.

It has been our constant effort to impress upon the profession the fact that our League was established primarily for the benefit of our profession and for our country, after we have attained the necessary proficiency to give it adequate service. Consequently we can truthfully say that every impelling motive merits the unqualified indorsement and coöperation of our great profession. Neither faction, fraternity, clique, nor politics can have anything to do with the broad principles upon which the League was organized.

We are endeavoring to assist our government to fill the Officers' Reserve Corps, Dental Section, with representative and competent members. This work has progressed to a point where the Surgeon-general's department is co-operating with us and the League is empowered to receive applications for the Dental Reserve, which will be forwarded to the department and assignments made to the various examining boards of such applicants. The Surgeon-general's department has been seriously handicapped in getting the revised regulations governing the Reserve Corps passed, but before this will have reached the reader the chairman of the League will have conferred with the department and definite arrangements completed whereby it is hoped the work may actively proceed. We have at the League headquarters a waiting list of more than two hundred applicants, to which numbers are being added every day. We regret this delay exceedingly; however, our work of preparation should not suffer therefrom, but be prosecuted even more vigorously.

We are arranging with the Red Cross to supply a dental unit with each Red Cross base-hospital throughout the country, and we would suggest that each unit already formed take this matter up with the organizers of the local base-hospital. This is a very important connection of the League, and gives us a definite status in this great work.

We are organizing a committee to formulate a plan whereby a dental company of League members may receive necessary military training similar to that of the medical profession arranged by the Council of National Defense. We urge our members to co-operate with this committee with the ultimate object of establishing at training camps a full equipment for dental service and oral surgery, and put into practical operation instructions received in the unit study clubs. More will be said regarding this plan very soon.

We are endeavoring to shape our plans to harmonize with the work of the Council of National Defense, and are connected with that body through Dr. E. C. Kirk, who is a member of that Council.

We are particularly pleased to announce the addition to our board of trustees of Dr. Truman W. Brophy. It is needless to comment on the great value of this connection for the future welfare of our organization.

We are anxious to receive new members, and by forwarding one dollar ($1.00) to the Preparedness League of American Dentists, 131 Allen St., Buffalo, N. Y., you will be entitled to receive all benefits of the parent organization.

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SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS *not later* than the 11th or 12th of the month preceding that of publication.

Coming Dental Society Meetings.

APRIL.

FIFTH DISTRICT (N. Y.) DENTAL SOCIETY. Syracuse. Two days: April 13th and 14th.

MICHIGAN STATE DENTAL SOCIETY. Detroit. Three days: April 12th to 14th.

MISSOURI STATE DENTAL ASSOCIATION. St. Joseph. Three days: April 4th to 6th.

SOUTH DAKOTA STATE DENTAL SOCIETY. Sioux Falls. Two days: April 26th and 27th.

TEXAS STATE DENTAL SOCIETY. Houston. Four days: April 25th to 28th.

VIRGINIA STATE DENTAL ASSOCIATION. Norfolk. Three days: April 17th to 19th.

MAY.

DENTAL SOCIETY OF THE STATE OF NEW YORK. Rochester. May 10th to 12th.

ILLINOIS STATE DENTAL SOCIETY. Quincy. Four days: May 8th to 11th.

INDIANA STATE DENTAL ASSOCIATION. Indianapolis. Three days: May 15th to 17th.

KENTUCKY STATE DENTAL ASSOCIATION. Louisville. Three days: May 9th to 11th.

LAKE ERIE DENTAL ASSOCIATION. Cambridge Springs, Pa. May 24th to 26th.

MASSACHUSETTS STATE DENTAL SOCIETY. Springfield. Three days: May 3d to 5th.

SOUTH CAROLINA STATE DENTAL ASSOCIATION. Columbia. Three days: May 8th to 10th.

SUSQUEHANNA DENTAL ASSOCIATION OF PENNSYLVANIA. Allentown. Three days: May 22d to 24th.

VERMONT STATE DENTAL SOCIETY. Burlington. Three days: May 16th to 18th.

JUNE.

AMERICAN MEDICAL ASSOCIATION. New York City. Five days: June 4th to 8th.

CONNECTICUT STATE DENTAL ASSOCIATION. New London. Three days: June 14th to 16th.

GEORGIA STATE DENTAL SOCIETY. Brunswick. Three days: June 14th to 16th.

NEBRASKA STATE DENTAL SOCIETY. Omaha. Four days: June 4th to 7th.

NORTH CAROLINA DENTAL SOCIETY. Durham. Three days: June 27th to 29th.

PENNSYLVANIA STATE DENTAL SOCIETY. Philadelphia. Three days: June 26th to 28th.

POSTGRADUATE DENTAL MEETING. [ALABAMA, MISSISSIPPI, TEXAS, AND LOUISIANA.] New Orleans. Four days: June 4th to 7th.

TENNESSEE STATE DENTAL ASSOCIATION. Memphis. Four days: June 19th to 22d.

Examiners' Meetings.

MAINE BOARD OF EXAMINERS. Augusta. July 12th to 14th.

MARYLAND BOARD OF EXAMINERS. Baltimore. May 30th and 31st.

NEW HAMPSHIRE STATE DENTAL BOARD. Manchester. June 28th to 30th.

NEW JERSEY BOARD OF REGISTRATION. Trenton. June 25th to 28th.

OKLAHOMA BOARD OF EXAMINERS. Oklahoma City. June 25th.

PENNSYLVANIA BOARD OF EXAMINERS. Philadelphia and Pittsburgh. June 13th to 16th.

SOUTH CAROLINA BOARD OF EXAMINERS. Columbia. June 26th.

TEXAS BOARD OF EXAMINERS. Houston. June 18th.

VERMONT BOARD OF EXAMINERS. Montpelier. June 25th to 27th.

VIRGINIA BOARD OF EXAMINERS. Richmond. June 12th.

American Medical Association.

NEW YORK CITY, JUNE 4TH TO 8TH.

(*Clinical—4th and 5th.*)

THE American Medical Association will hold its annual meeting in New York City, June 4 to 8, 1917. In all probability this will be the greatest meeting of medical men ever held in this country. The Committee on Arrangements consists of Drs. Wendell C. Phillips, Floyd M. Crandall, and Alexander Lambert. Headquarters at 17 West 43d st., New York City, to which all communications should be addressed. Monday and Tuesday, June 4th and 5th, will be devoted to a Clinical Congress. All departments of medicine will be represented, each department to have its own series of clinics, occurring in different parts of the city.

* * * * *

The great number of clinics, their scope and scientific value, will be unprecedented. The program is in active preparation, soon to appear in full in the *Journal* of the A. M. A.

Between seven and ten thousand physicians are expected to attend this congress, and it is hoped that dental practitioners throughout the country will utilize this opportunity to become associate fellows of the Section on Stomatology, and thus be entitled to attend these clinics as well as the regular meeting of the association on June 6–8. The following is from a letter of the General Secretary:

> Dentists holding the degree of D.D.S. who are members of state or local dental societies and who are not eligible to regular membership, may be elected to associate fellowship by the House of Delegates of the American Medical Association when a formal application for such associate fellowship has been approved by the Section on Stomatology. In other words, when a dentist holding the required degree makes formal application for associate fellowship, accompanying this application with a certificate from the secretary of his state or local dental society, which certificate certifies to his being a member in good standing in that body, this application and the attached certificate is forwarded to the secretary of the Section on Stomatology for the approval of that section. The application is then in form for presentation to the House of Delegates for the election or rejection of the applicant.
>
> We shall be glad to transmit any such applications, or they may be sent direct to the secretary of the Section on Stomatology, Dr. Eugene S. Talbot, 31 N. State st., Chicago.

Headquarters of the Section on Stomatology will be at the Hotel Astor, Broadway. and 45th st.

No more impressive opportunity for the fraternization of dental and medical men has ever been presented in the history of the profession. Every dentist who reads this announcement should enroll immediately in the

Section on Stomatology (annual dues $5, which entitles him to the weekly *Journal* of the A. M. A.), and thus place himself in direct touch with the greatest happenings in medical science.

The Clinical Committee of the Section on Stomatology is as follows:

Henry W. Gillett,
Arthur L. Swift,
Wm. D. Tracy,
Henry S. Dunning,
Arthur H. Merritt,
Wm. B. Dunning, *Chairman*,
140 West 57th st., New York City.

Philadelphia Dental College.

A reunion of the class of 1907, Philadelphia Dental College, will be held at Philadelphia, April 17 and 18, 1917.

C. W. Vivian,
Hartford, Conn.

Pennsylvania College of Dental Surgery.

Attention of Class of 1892.

The members of the class of 1892, Pennsylvania College of Dental Surgery, are requested to send their names and present location to the undersigned. The holding of the twenty-fifth anniversary of the class is the object in view.

J. E. Mitinger,
Greensburg, Pa.

Michigan State Dental Society.

Detroit, the wonder city of the middle West, will be the meeting-place for the sixty-first annual meeting of the Michigan State Dental Society, April 12, 13, and 14, 1917.

The growing necessity for individual efficiency in dental operations should find seven hundred out of the eight hundred members of the society present. "It is for better dentistry."

All ethical dentists are invited to attend and become members, and members of other associations are cordially invited.

C. G. Bates, *Sec'y*,
Durand, Mich.

Fifth District (N. Y.) Dental Society.

The annual meeting of the Fifth District Dental Society of the State of New York will be held at the Onondaga Hotel, Syracuse, N. Y., April 13 and 14, 1917.

B. T. Mason, *Sec'y*,
238 Oneida st., Fulton, N. Y.

Texas State Dental Society.

The Texas State Dental Society will meet in Houston, Texas, April 25 to 28, 1917. Day sessions only.

W. O. Talbot, *Sec'y-Treasurer*,
Fort Worth, Texas.

South Dakota State Dental Society.

The thirty-fifth annual meeting of the South Dakota State Dental Society will be held at Sioux Falls, April 26 and 27, 1917.

Ernest W. Elmen,
Sioux Falls, S. D.

Virginia State Dental Association.

The Virginia State Dental Association will meet in Norfolk, April 17, 18, and 19, 1917. All members of the National Dental Association or any state society are cordially invited to attend.

C. B. Gifford, *Cor. Sec'y*,
Norfolk, Va.

Missouri State Dental Association.

The Missouri State Dental Association will hold its fifty-second annual meeting in St. Joseph, Mo., April 4, 5, and 6, 1917. A splendid program is in course of preparation, which will include a number of papers by the strongest men in the dental profession, dealing with subjects of special interest to every dentist.

A first-class clinical program is also in course of preparation, which will include new ideas and new methods of practice. The manufacturers' exhibit will present the newest materials and instruments used in dentistry.

Members of the National Dental Association and all members of state societies are extended a cordial invitation.

J. F. Wallace, *Sec'y*,
Canton, Mo.

Illinois State Dental Society.

The fifty-third annual meeting of the Illinois State Dental Society will be held at Quincy, Ill., May 8, 9, 10, and 11, 1917.

Henry L. Whipple, *President*,
J. P. Luthringer, *Sec'y*.

Massachusetts State Dental Society.

The fifty-third annual meeting of the Massachusetts State Dental Society will be held on May 3, 4, and 5, 1917, at Springfield, Mass.

J. Arthur Furbish, *Sec'y*,
Boston, Mass.

Lake Erie Dental Association.

The fifty-fourth annual meeting of the Lake Erie Dental Association will be held at the Hotel Barlett, Cambridge Springs, Pa., on May 24, 25, and 26, 1917.

D. S. Sterrett,
Erie, Pa.

Kentucky State Dental Association.

The next annual meeting of the Kentucky State Dental Association will be held in Louisville the three days previous to the Kentucky Derby, May 9, 10, and 11, 1917. Address all correspondence to

W. M. Randall, *Sec'y*,
Louisville, Ky.

South Carolina State Dental Association.

The forty-seventh annual meeting of the South Carolina State Dental Association will be held in Columbia, S. C., at the Jefferson Hotel, on May 8, 9, and 10, 1917.

J. T. Montgomery, *Pres.*,
Spartanburg, S. C.
Ernest C. Dye, *Sec'y*,
Greenville, S. C.

Indiana State Dental Association.

The fifty-ninth annual meeting of the Indiana State Dental Association will be held at the Claypool Hotel, Indianapolis, on May 15, 16, and 17, 1917. A very good program of papers and clinics has been prepared, and a sincere invitation is extended to members of other state dental associations to attend.

A. R. Ross, *Sec'y*,
LaFayette, Ind.

Vermont State Dental Society.

The next meeting of the Vermont State Dental Society will be held May 16 to 18, 1917, at Burlington, Vt.

P. E. Mellen, *Sec'y*,
Middlebury, Vt.

Pennsylvania State Dental Society.

The forty-ninth annual meeting of the Pennsylvania State Dental Society will be held in Philadelphia, June 26, 27, and 28, 1917, at the Bellevue-Stratford Hotel.

J. F. Biddle, *Sec'y*,
Pittsburgh, Pa.

Nebraska State Dental Society.

The Nebraska State Dental Society will hold its fiftieth annual meeting, in celebration of its golden jubilee, in Omaha, June 4, 5, 6. and 7, 1917. All members of the National Association are cordially invited.

H. E. King, *Sec'y*, Omaha, Neb.

North Carolina Dental Society.

The North Carolina Dental Society will hold its forty-third annual meeting at Durham, N. C., June 27, 28, and 29, 1917.

R. M. Squires, *Sec'y*,
Wake Forest, N. C.

Georgia State Dental Society.

The forty-eighth annual meeting of the Georgia State Dental Society will be held at Brunswick, Ga., June 14, 15, and 16, beginning Thursday, June 14th. We extend a most cordial invitation to members of other associations to meet with us.

For application blanks and full particulars, address

M. M. Forbes, *Sec'y*,
803, 804 Candler Bldg., Atlanta, Ga.

Connecticut State Dental Association.

The fifty-third annual meeting of the Connecticut State Dental Association will be held at the Hotel Griswold, New London, Conn., June 14, 15, and 16, 1917.

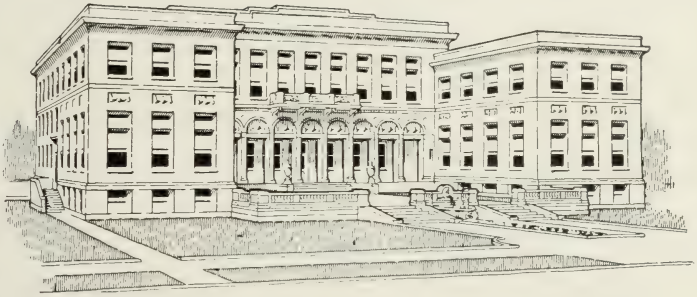
Papers and clinics of unusual interest have been secured, which with the excellent accommodations offered by the Griswold, will make this one of the most attractive meetings in the history of the association.

Geo. S. B. Leonard, *Sec'y*,
Mystic, Conn.

Dental Society of the State of New York.

ANNUAL MEETING, ROCHESTER, MAY 10-12, 1917.

THE forty-ninth annual meeting of the Dental Society of the State of New York will be held in Convention Hall, Rochester, N. Y., May 10, 11, and 12, 1917.



ROCHESTER'S NEW DENTAL DISPENSARY

WILL BE

Formally Dedicated May 9, 1917,

IN CONJUNCTION WITH THE

Forty-ninth Annual Convention of the Dental Society of the State of New York.

Men of national reputation will be here with messages of vital importance to you. Make your reservations today.

THE COMMITTEE.

EDWARD G. LINK, *Chairman*,
226 Cutler Bldg., Rochester, N. Y.
LOUIS MEISBURGER, Rochester, N. Y.
WIRT H. CONKLIN, Rochester, N. Y.

Note that the dedication of the Rochester Dental Dispensary—the gift of Mr. George Eastman to the city of Rochester—will take place on Wednesday, May 9th, and the profession is cordially invited.

The Executive Council will meet in Buffalo on the afternoon of May 9th, organize, and then adjourn, to meet in Rochester the following day.

The program of essays and clinics, coupled with other educational features and many forms of entertainment, will make this one of the most successful meetings in the history of the New York Society; in fact, it will be one of the big meetings of the year.

The manufacturers' exhibit will be exceptionally beautiful, and will include practically every up-to-date product, appliance, etc., in the dental trades.

All exhibits, clinics, and meetings will be held in Convention Hall, located in the heart of the city and near the hotels, theaters, and the retail shopping district.

The month of May is exceptionally beautiful in Rochester (the Flower City), which is famous for its beautiful homes, parks, scenery, and extensive gardens.

The officials and members of the New York Society extend to all ethical dentists a most cordial and fraternal greeting to meet with them, together with the assurance that everything possible will be done to make the visit a pleasant and profitable one.

Programs and general information can be obtained of

A. P. BURKHART, *Sec'y*,
52 Genesee st., Auburn, N. Y.

Susquehanna Dental Association of Pennsylvania.

The fifty-fourth annual meeting of the Susquehanna Dental Association will be held in the Odd Fellows' Temple, 118 N. Ninth st., Allentown, Pa., May 22, 23, and 24, 1917. The high standard of meetings set by the Susquehanna is being kept in mind, and the committee is sparing no effort to make this a meeting which, for benefit and pleasure, will be long remembered.

Odd Fellows' Temple is admirably adapted to our purpose, and easy of access, as you will agree when you have seen it. We think it is superior to any meeting-place we have had.

This meeting will be so good that you cannot afford to miss it. If you are in a rut, come and let us help you out of it. Your presence is all that is required to make the 1917 meeting a real success. Cross off the dates in your appointment book now.

Howard S. Seip, *Ch'man Ex. Com.*

Postgraduate Dental Meeting:

Alabama, Mississippi, Texas and Louisiana.

The states of Alabama, Mississippi, Texas, and Louisiana will hold a joint postgraduate meeting on June 4, 5, 6, and 7, 1917, in New Orleans, La. This will be immediately followed by a special detailed technical course, negotiations for which are being made with some of the most talented clinicians throughout the country. The time of the meeting, June 4th to June 7th, besides being a most agreeable season of the year, enables the committee to secure the services of experts in the work to be covered by the meeting, who would not be accessible at an earlier time in the year.

The subjects which will be covered during the meeting proper, by illustrated lectures, moving pictures, and clinics, and which will be given in their entirety, are "Removable Bridge Work," with the most advanced lock and saddle construction. "New Methods of Replacing Lost Teeth Without Mutilation of Sound Members by a System of Saddles, Cast Inlay-fitting Clasps," etc. "Nerve Blocking," including the various phases of local anesthesia. "Radiography." "Root-canal Preparation and Filling." "Apicoectomy." "Treatment of Fractures of the Maxilla and Mandible." "Treatment of the Maxillary Sinus." "Prophylaxis, Periodontia, and Stomatology."

Experts placed in charge of the above subjects will each give special courses, starting immediately after the meeting, and lasting two or three days, or a little longer where the nature of the work requires it. Classes will be formed from among holders of membership cards to the meeting, which none but ethical dentists can obtain. These classes must necessarily be limited in size. Early application for membership and for special courses is urged, and the latter cannot be had without the former. Enrolment in the order of registration. Apply to Dr. C. V. Vignes, chairman Committee on Credentials and Registrations, 709 Macheca Bldg., New Orleans.

The committees representing the four states will conjointly fix membership fees.

The Committee on Publicity, Dr. J. P. Wahl, chairman, 1135 Maison Blanche Building, New Orleans, will shortly issue summaries of the work to be taught by each instructor at the meeting. Arrangements are being made relative to railroad and hotel rates, exhibits, entertainment, clinics and floor arrangements, and will be announced later.

Jules J. Sarrazin, *General Chairman,*
Leo C. Dempsey, *General Sec'y,*
Louisiana Committee.

Tennessee State Dental Association.

Golden Jubilee.

The "golden jubilee" of the Tennessee Dental Association will be held in Memphis, June 19, 20, 21, and 22, 1917. The officers promise the most attractive program ever presented in the South. Social features will be prominent. All ethical dentists invited. Come and bring your wives.

D. M. Cattell, *President,*
C. E. Hines, *Sec'y.*

New Jersey State Dental Society.

The forty-seventh annual convention of the New Jersey State Dental Society will be held at Atlantic City, N. J., on July 11, 12, and 13, 1917.

A cordial invitation is extended to ethical practitioners.

John C. Forsyth, *Sec'y,*
430 E. State st., Trenton, N. J.

Maryland Board of Examiners.

The Maryland Board of Dental Examiners will meet for examination of candidates for certificates on May 30 and 31, 1917, at the Dental Department of the University of Maryland, Baltimore, at 9 A.M.

For application blanks and further information address

F. F. Drew, *Sec'y*,
701 N. Howard st., Baltimore, Md.

New Jersey Board of Registration.

The State Board of Registration and Examination in Dentistry of New Jersey will hold their annual meeting and examinations in the Assembly chamber, at the State-house, Trenton, N. J., on June 25, 26, 27, and 28, 1917. License fee $25, re-examination fee $10.

Practical tests required: Insertion of an approximal gold filling, with approximating tooth in position, compound approximal amalgam filling, a silicate filling, practical test of the applicant's ability in oral prophylaxis, and preparation of a cavity for an inlay with wax pattern. Also the soldering of a bridge consisting of three or more teeth, exclusive of abutments, and one Richmond crown, which may be one of the abutments of the bridge. These must be made of gold or silver; platinum backings may not be used. The bridge must be struck from dies made from an impression of the mouth, and the articulating model, with the bridge, when soldered, must be submitted for inspection. An anatomical articulation of a full upper and lower set of teeth will also be required; teeth to be furnished by the applicant. The wax bite must be properly trimmed and in place on models for inspection before setting up the teeth.

The theoretical subjects upon which candidates will be examined are anatomy, histology, materia medica, therapeutics, chemistry, theoretical prosthetic dentistry, crown and bridge work, pathology, bacteriology, oral surgery, anesthesia, theoretical operative dentistry, metallurgy, orthodontia, physiology, oral hygiene, and dental jurisprudence.

Attention is directed to the following quotation from the dental law of New Jersey: "Applicant shall present to said board a certificate from the commissioner of education of this state, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study in an approved public or private high school, or the equivalent thereof." [Those who entered a dental college prior to January 1, 1914, must present a certificate showing a three-year high school course.] In accordance with this law the secretary will issue application blanks only upon presentation of the required certificate from the commissioner of education, State-house, Trenton, N. J.

Applications must be filed complete ten days before the date of the examination. Address all communications for further particulars to

John C. Forsyth, *Sec'y*,
430 E. State st., Trenton, N. J.

New Hampshire State Dental Board.

The New Hampshire State Dental Board will hold its next examinations on June 28, 29, and 30, 1917, in Masonic Banquet Hall, Manchester, N. H. Application blanks and further information may be obtained of

Harry L. Watson, *Sec'y*,
913 Elm st., Manchester, N. H.

Oklahoma Board of Examiners.

The next regular semi-annual meeting of the Oklahoma Board of Dental Examiners will be held in Oklahoma City, Okla., at the Skirvin Hotel, beginning June 25th. Only graduates of reputable colleges presenting fifteen units credit in literary work eligible to take examination. For further information write

H. Overbey, *Sec'y*,
Ryan, Okla.

Vermont Board of Examiners.

The next meeting of the Vermont Board of Dental Examiners, for the examination of candidates to practice in Vermont, will be held at the State-house, Montpelier, commencing at 2 P.M. on June 25, 1917, and continuing for three days.

To be eligible for examinations a candidate must be (1) twenty-one years of age, (2) a graduate of a high school of the first class, and (3) of a reputable dental college.

Applications must be in the hands of the secretary not later than June 15th. For further information apply to

Harry F. Hamilton, *Sec'y*,
Newport, Vt.

Pennsylvania Board of Examiners.

The next examination of the Pennsylvania Board of Dental Examiners will be held in Musical Fund Hall, 808 Locust st., Philadelphia, and the College of Pharmacy Building, Pittsburgh, on Wednesday, Thursday, Friday, and Saturday, June 13, 14, 15, and 16, 1917. The examination in operative dentistry will be held on Wednesday, June 13th, at 8.30 o'clock, in the Evans Dental Institute, 40th and Spruce sts., Philadelphia, and the University of Pittsburgh Dental Building, Pittsburgh. The examination in prosthetic dentistry will be held on Wednesday at 1.30. Application papers can be secured from the department of Public Instruction, Harrisburg. For further information address

Alexander H. Reynolds, *Sec'y*,
4630 Chester ave., Philadelphia, Pa.

Maine Board of Examiners.

The Maine Board of Dental Examiners will hold its only meeting for the year at the state Capitol, July 12, 13, and 14, 1917.

Will S. Payson, *Sec'y*,
Castine, Me.

Virginia Board of Examiners.

The regular annual meeting of the Virginia State Dental Board, for the examination of applicants to practice dentistry in Virginia, will be held in the city of Richmond, Va., June 12, 1917.

The board will convene at the Medical College of Virginia at 9 a.m. on the date above given.

For further information address

J. P. Stiff, *Sec'y*,
Fredericksburg, Va.

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UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING FEBRUARY 1917.

February 6.

No. 1,214,556, to Nate Le Vene and Esa Fee. Sanitary toothbrush.

No. 1,215,087, to Faneuil D. Weisse. Attachment of dental manikin heads to the patients' headrests of dental chairs.

February 13.

No. 1,215,442, to Wm. E. Walker and J. Mort. Walker. Orthodontia appliance.

No. 1,215,678, to Missak-Marouke. Filling material for teeth.

No. 1,216,107, to Thomas F. Glenn. Artificial tooth.

No. 1,216,159, to Raleigh R. Oldham. Knockdown toothbrush.

February 20.

No. 1,216,284, to Arthur W. Cash. Tapping machine.

No. 1,216,311, to Henry T. Hartman. Dental brush.

No. 1,216,375, to Alexander Sved. Attachment to dental engines.

No. 1,216,514, to Samuel J. Symmons. Dental pliers.

No. 1,216,625, to Samuel D. Strohm. Controller support for dental chairs.

No. 1,216,683, to Edwin J. Greenfield. Method of implanting artificial denture roots.

February 27.

No. 1,217,206, to Clinton A. Nixon. Dental mold unit.

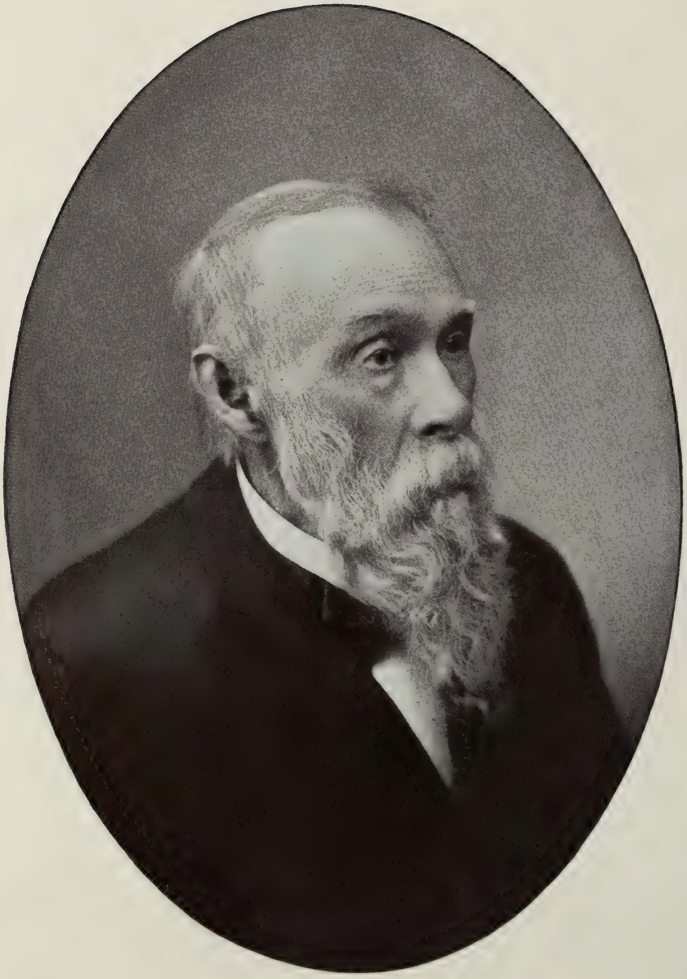
No. 1,217,264, to Frank L. Baxter. Toothpick.

No. 1,217,374, to Wm. Ernest Walker. Orthodontia.

No. 1,217,403, to John H. Brown. Dental tool.

No. 1,217,779, to Roy C. Kleckner. Dental floss holder.

No. 1,217,866, to Otto G. Hess. Artificial tooth.



DR. CORYDON PALMER.

THE

DENTAL COSMOS

VOL. LIX. MAY 1917. No. 5.

ORIGINAL COMMUNICATIONS

The Relation of Dental Infection to Systemic Disease.

By EDWARD C. ROSENOW, M.D., Rochester, Minn.,
MAYO FOUNDATION.

(Read before the Pennsylvania State Dental Society, at its annual meeting, Pittsburgh, June 28, 1916.)

CLINICAL evidence of the etiologic relationship between chronic circumscribed infections, particularly those in tonsils and teeth, and systemic disease is now becoming generally recognized. The idea is not new, for attention has been called to this mode of origin of various diseases by a few observers for many years. Its broader application has been emphasized especially by Billings.*

Gilmer and Moody, in a bacteriologic study of alveolar abscess and infected root-canals, have found the predominating organism to be a streptococcus. Hartzell and Henrici found that out of 162 alveolar abscesses, 150 yielded streptococci. Intravenous injections into rabbits of these streptococci produced lesions in the kidneys, aorta, heart muscle, and joints. Ulrich states that "A little over 68 per cent. of all artificially devitalized teeth were found with apical abscesses, and the total number of abscesses of 1350 dead teeth, including those found on pulpless teeth, due to caries, to accident, or to proximal findings, was 83 per cent."

In a further study of alveolar abscesses in their relation to systemic disorders, Moody, as cited by Gilmer, found that "The streptococcus viridans isolated from chronic alveolar abscesses in patients who, in addition, are suffering from systemic disease, is capable of producing a higher percentage of lesions in rabbits, in the usual regions involved, than similar organisms isolated from uncomplicated chronic alveolar abscesses."

Among the numerous authors on this subject the following are cited: Chas. H. Mayo, Moorehead, White, Fischer, and Daland.

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* A summary of Billings' studies on Focal Infection was given in the "Lane Medical Lectures," published in book form by D. Appleton & Co., New York, 1916.

The localization of the bacteria and their products at points distant from the focus of infection has been considered chiefly as accidental. Granting that accident plays some rôle, there are many reasons for believing that in order that bacteria may grow and produce lesions in a given tissue, certain delicately balanced conditions must prevail. The blood is invaded by pneumococci in probably all cases of pneumonia at some time during the attack, but there is usually only one localization—the lung. Typhoid bacilli have been isolated from the blood from numerous cases of typhoid fever in which there was only the characteristic localization—lymphoid follicles of the intestines, etc. In chronic infectious endocarditis, streptococci circulate in the blood more or less continuously for weeks, and even months, without manifest localization other than in the endocardium. The occurrence commonly of certain complications such as conjunctivitis or sinusitis in some epidemics of throat infections, and sinus thrombosis in others, is well known. Gilmer and Moody call attention to the occurrence of alveolar abscess in epidemic form when streptococcus infections of the upper respiratory tract are prevalent. These facts speak for the presence of particular infecting powers of the microorganisms at hand.

Some years ago I showed that the common occurrence of endocarditis in animals, following intravenous injection of a staphylococcus from endocarditis, and numerous strains of Streptococcus viridans from chronic infectious endocarditis, depended to a certain extent on clump formation, and that simultaneously with the disappearance of this property, both from artificial cultivation and animal passage, endocarditis failed to develop. Detweiler and Robinson have reported similar results with Streptococcus viridans of low virulence from endocarditis and other sources.

TRANSMUTATION OF BACTERIA.

During my studies on the transmutation of pneumococci and streptococci (13) in which relatively avirulent strains were made virulent by successive animal passages, and highly virulent strains less virulent by cultivation on artificial media, marked changes in localization following intravenous injection in animals were noted. At certain lower grades of virulence, endocarditis, arthritis, cholecystitis, ulcer of the stomach, myositis and iritis (14) respectively, occurred, while when the virulence was high, hemorrhages and edema of the lung and broncho-pneumonia commonly occurred. The results suggested the possibility that diseases of widely different symptomatology might be due to strains of bacteria of the same or closely related species, but having peculiar localizing or infecting powers. Since then, systematic cultures in which there was afforded a gradient of oxygen pressure have been made from diseased tissues in a series of diseases. Streptococci frequently very sensitive to oxygen have been isolated in many instances from the involved tissues, often to the exclusion of other bacteria, in rheumatic fever, arthritis deformans, appendicitis, ulcer of the stomach, cholecystitis, and myositis, and a diphtheroid-like streptococcus from the erythematous node in erythema nodosum. The streptococci from rheumatic fever and erythema nodosum, especially, showed a preference for diminished oxygen tension. Intravenous injection soon after isolation of these strains and commonly of those from the respective foci of infection often showed a most marked tendency to localize electively in the tissues in animals corresponding to those involved in the spontaneous disease in man.

Table I gives the percentage incidence of lesions in the various organs in animals following intravenous injection of streptococci from a wide range of sources. The figures are therefore directly comparable. The figures showing incidence in the characteristic organ are printed in heavy type.

The figures in the lowest line of the table represent the results of numerous experiments (883) with streptococci (220) from a wide range of sources, and may therefore be regarded as an index of

TABLE I.—Elective Localization of Streptococci.

Source of Streptococci.		Strains (220).	Animals injected (833).	Percentage of Animals Showing Lesions in—																
				Appendix.	Stomach. Hemor.	Duodenum. Ulcer.	Gall-bladder.	Pancreas.	Intestines.	Joints.	Endocardium.	Pericardium.	Myocardium.	Muscles.	Kidney.	Lung.	Skin.	Tongue.	Eye.	Parotid.
Appendicitis	When isolated	14	68	**68**	6	1	1	0	9	29	21	0	9	12	0	0	0	0	3	0
	Later	8	26	15	19	15	4	0	0	22	19	0	12	23	0	0	0	0	0	0
	After animal passage	7	22	45	45	30	40	0	20	36	20	0	20	25	10	0	0	0	0	0
Ulcer of stomach in man	When isolated	18	103	2	**60**	**60**	20	3	7	16	12	4	5	0	5	0	0	0	0	0
	Later	8	22	5	5	0	5	0	0	18	14	0	0	0	0	0	0	0	0	0
	After animal passage	7	39	0	23	33	30	15	15	21	5	0	3	3	8	15	0	0	0	0
Cholecystitis	When isolated	12	41	0	29	15	**80**	5	17	17	10	0	2	7	5	5	2	0	0	0
	Later	5	14	14	28	14	7	0	0	21	14	0	0	0	7	0	0	0	0	0
	After animal passage	4	16	0	31	13	56	19	13	25	19	0	13	0	13	6	0	0	0	0
Rheumatic fever	When isolated	24	71	8	23	18	3	3	13	**66**	**46**	27	**44**	27	39	4	6	0	10	0
	Later	8	14	0	14	21	0	0	0	21	21	0	28	0	21	0	0	0	0	0
	After animal passage	5	19	21	37	21	5	21	0	37	53	32	37	16	42	21	0	0	11	0
Erythema nodosum	When isolated	6	20	0	10	0	0	0	5	20	20	10	0	35	10	5	**90**	0	5	0
	Later	3	9	0	22	0	11	0	0	11	11	0	0	0	0	0	22	0	0	0
	After animal passage	6	14	0	21	0	50	0	7	50	14	7	14	50	7	43	43	0	0	0
Herpes zoster	When isolated	11	61	10	29	8	16	2	8	11	5	11	5	11	5	21	**70**	15	15	0
	Later	6	15	0	13	7	7	13	7	60	7	0	20	40	7	20	7	0	13	0
	After animal passage	4	7	0	28	10	0	0	0	43	0	14	0	28	0	43	28	14	0	0
Mumps	When isolated	9	19	15	21	5	21	42	10	42	15	0	37	3	5	15	15	0	0	**73**
	Later	5	8	12	0	0	0	12	12	24	24	0	12	12	0	12	12	0	0	24
Myositis	When isolated	3	40	2	4	10	2	7	7	20	10	0	**35**	**75**	2	0	7	0	8	0
Endocarditis	When isolated	8	44	0	7	0	5	0	15	15	**84**	4	20	0	20	20	2	0	0	0
Miscellaneous	When isolated	34	41	3	17	0	4	0	4	17	20	0	15	7	7	7	0	0	0	0
"Lab." strains	Before and after animal passage	5	100	2	18	5	2	2	2	45	49	0	15	12	10	17	2	0	6	0
Average p. c. of animals injected with non-"specific strains"* showing lesions in individual organs				5	20	9	11	6	8	27	14	2	10	12	9	11	2	1	3	0

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* "Specific strains" include only those "when isolated" and having elective affinity, and not those after cultivation for a time, nor after animal passage.

TABLE II.—ELECTIVE LOCALIZATION OF STREPTOCOCCI AND STAPHYLOCOCCI IN THE NERVOUS SYSTEM.

SOURCE OF BACTERIA.	Strains.	Animals injected.	Appendix.	Stomach or duodenum, H.	Stomach or duodenum, U.	Gall-bladder.	Liver.	Pancreas.	Intestines.	Joints.	Endocardium.	Pericardium.	Myocardium.	Muscles.	Kidney.	Lung.	Skin.	Teeth.	Nerve trunks.	Meninges.	Spinal cord.	Brain.	Dorsal roots.
Multiple sclerosis	3	31	0	6	3	10	3	3	0	13	3	3	6	29	23	3	0	0	0	23	**53**	13	0
Sporadic anterior poliomyelitis	1	36	0	17	0	3	6	0	3	8	0	6	3	14	31	0	3	0	19	25	**78**	14	0
Transverse myelitis	1	21	5	24	19	0	0	0	33	14	14	10	14	24	10	10	5	0	5	**50**	**67**	24	0
Neuralgia	4	18	0	6	0	6	6	0	0	11	22	0	6	33	6	33	28	0	28	22	6	0	**83**
Multiple neuritis	1	19	11	11	5	5	0	0	11	22	5	16	11	27	16	32	0	0	**79**	0	5	5	0
Myositis and dental neuritis	1	24	0	13	0	8	0	0	0	4	13	0	4	**71**	13	0	0	**50**	**46**	0	0	0	0
"Myalgia"	12	29	3	10	14	3	3	0	0	**48**	24	0	**28**	**93**	17	3	3	0	7	7	3	3	0
Average incidence of lesions exclusive of specific strains			3	12	6	5	3	0	7	12	12	5	7	27	17	15	6	0	12	13	4	8	0

the liability of the various organs to streptococcus infections. Thus, joint lesions occurred more often (27 per cent.) than lesions in other organs, corresponding to the frequent occurrence of spontaneous arthritis in man and animals. The occurrence of lesions in the stomach (20 per cent.), valves of the heart (14 per cent.), myocardium (12 per cent.), and skeletal muscles (12 per cent.), corresponds in a general way to the occurrence of infection in these organs in man. The very infrequent involvement of the skin, the tongue, and the parotid in the animals is in keeping with the rarity of embolic infections in these structures. The character of the lesions and their occurrence simultaneously in the joints, heart, muscles, and kidney, and the development of chorea (7 per cent., mostly in young rabbits) following injection of the streptococci from rheumatic fever, parallel quite closely the phenomena of rheumatic infection observed in man. The strains from erythema nodosum resemble those from rheumatic fever, producing a relatively high incidence of arthritis, pericarditis, and myositis—a fact which supports the view held by clinical observers that the causative agents of rheumatic fever and erythema nodosum must be similar.

By the use of a similar technique verification of the results in ulcer has been brought forward by Gerdine and Helmholz, and by Hardt. The results in iritis have been verified and extended by Irons, Brown, and Nadler.

DENTAL FOCI OF INFECTION AS THE CAUSE OF NERVOUS DISEASES.

Owing to the wealth of material at my disposal in the Mayo Clinic and the willing co-operation of the patients and the members of the staff, I have had opportunity to study by means of the same technique the relation of foci of infection to diseases of the nervous system. Effort was made to obtain bacteria for cultures from the depth of the focus by expressing the infected material from tonsils with a modified laryngeal mirror, and by aspirating the infected pockets about teeth with a sterile pipet. In the former it commonly happened that abscesses were ruptured, even in tonsils which appeared quite normal on the surface. These were usually situated in the pole of the tonsil. Tonsillectomy and extraction of teeth were done when indicated.

In Table II is given a summary of the results obtained. The figures again indicate the percentage incidence of focal lesions in the various organs. In a few instances the figures only approximate the actual occurrence of lesions in various organs because they were not looked for in all the animals injected, the pulps of from only four to six teeth and approximately three-fourths of the spinal roots being examined as a routine for lesions. Lesions in the liver, spleen, thyroid, lymph glands, tonsils, tongue, parotid, eyes, and reproductive organs occurred so rarely that they are not included in the table. In the last line is given the percentage incidence of lesions in various organs exclusive of the specific strains. These figures serve as a basis for comparison. They correspond in a general way to those given in Table I.

The bacteria in the diseases indicated in Table I were isolated both from foci of infection and from the diseased tissue in many instances. Those given in Table II were from foci of infection only. The focus was usually in the tonsil, but identical results were obtained in numerous instances with the bacteria from alveolar abscesses, pyorrhea pockets, and sinuses.

The results in Table I show strikingly how important it is to inject the bacteria very soon after isolation in order to demonstrate elective localizing powers, because these tend promptly to disappear on artificial cultivation, and more slowly on animal passage. In some instances incubation for from twenty-four to forty-eight hours aerobically was sufficient to cause the elective localizing power to disappear. A more detailed discussion of these results is given in two papers on elective localization.(15) (17)

I must emphasize the results obtained with the slightly hemolyzing streptococcus isolated from the dead pulp of a tooth and excised muscle from the neck of a patient with myositis and dental neuritis; 71 per cent. of the twenty-four animals injected showed myositis, 50 per cent. dental pulpitis, and 46 per cent. neuritis, chiefly of the dental nerves.(16)

The patient had had repeated attacks for five or six years of neuralgia of the face beginning with severe pain and swelling over the left upper jaw, and spreading to the opposite side. This was associated with soreness in the tooth, especially in the upper jaw, and followed by intense pain and swelling of the glands in the left side of the head, neck, and shoulders. Her tonsils were removed four years ago, but the condition was not relieved. One year ago the upper left second molar, showing a blind abscess at the root, was extracted. The left maxillary sinus was drained and a piece of the left turbinate removed, but without relief. The patient had become extremely nervous, at times hysterical, during the paroxysmal pain, and had one or two spells of mental confusion suggesting *petit mal*. The symptoms represent a condition which occurs quite commonly, particularly in neurotic persons.

The upper left first molar appeared to be a "dead" tooth. Owing to the fact that each attack began with swelling of the left upper jaw opposite it, this tooth was extracted. There was found a semilunar eroded area, 2 mm. in diameter, near the apex of the larger and inner root. The canal of this root was filled with a foul-smelling pus. The erosion was so situated that it was impossible to demonstrate it by roentgenograms. The canals of the other two roots were filled and obliterated and there were no erosions at the apices.

Directly opposite the putrescent pulp was a large cement filling. Smears from the root showed a few Gram-positive diplococci and diphtheroid bacilli, and a few Gram-negative bacilli. The primary cultures in the ascites-dextrose agar and broth gave a pure culture of a slightly hemolyzing streptococcus. After the extraction of the tooth the patient developed an unusually severe attack of neuralgia. Ten days afterward there was freedom from pain. Following this attack there was found definite tenderness of the muscles in the posterior triangle of the left side of the neck, and two distinctly tender nodules just behind the posterior margin of the sternomastoid muscle. One of these tender nodules was thought to be a lymph gland, and a portion of the deeper muscle was excised. The excision of the fascia and muscle precipitated another violent attack of pain and spasm of the muscles of the left side of the neck. The cultures in tall columns of the ascites plain broth of the emulsion of the muscle showed pure culture of short-chained streptococci, and those from the thickened fascia, streptococci and staphylococci. It was thought that these streptococci might be present quite generally on the mucous membrane. Cultures from the nose and pharynx, and of the stool, proved that this was actually the case. Sections of the excised muscles showed marked increase in interstitial tissue, poorly staining nuclei of adjacent muscle fibers, and slight round-cell infiltration. Sections of the fibrous nodule and fascia showed old and young connective tissue, absence of lymphoid tissue, small nests of round cells, plasma cells, and erythrocytes, chiefly around bloodvessels. Stains for bacteria revealed a moderate number of diplococci in or adjacent to the fibrous tissue between the muscle fibers, and a large number of nests of cellular infiltration within and surrounding a small-sized bloodvessel in the center of the fibrous nodule.

This is, as far as can be determined, the first experimental demonstration of the production of dental neuritis and pulpitis by intravenous injection of bacteria, and is in accord with the view held by some observers that infection of the pulps of sound teeth is always hematogenous in origin. Its occurrance warrants search for a focus in the tonsils or elsewhere. In the light of these experimental results, is it not likely that abscesses about devitalized teeth frequently have the same origin? The results in this case show also that a foul pulp with no abscess at the apex and having negative roentgen findings, or with only a small granuloma, is sufficient to act as a focus of infection. I mention this point particularly because of the erroneous impression in the minds of many, that negative roentgen findings of the jaws exclude the presence of foci of infection in this region.

In one case of acute pyorrhea the bacteria in the first culture injected intravenously into a rabbit produced hemorrhage and edema of the peridental membrane, suggesting that Riggs' disease may not always be the result of the local condition of the teeth or gum, but may in some instances be due to hematogenous infection by bacteria having this peculiar localizing power. However, further experiments are necessary before conclusions can be drawn.

In another case similar studies indicated the etiologic relationship between a severe pyorrhea and heart-block.

NECESSITY OF CLOSER AFFILIATION BETWEEN THE MEDICAL AND DENTAL PROFESSIONS.

The relationship between dental infections and various systemic diseases is demonstrated. The eradication of these foci of infection, often symptomless, is indicated. The exact methods to be followed in ridding patients of existing dental foci of infection must be decided in each individual case. A severe pyorrhea, if incurable by other means, calls for extraction of the affected teeth. Pulpless and abscessed teeth are to be regarded as a serious menace to continued health, and, with relatively few exceptions, should be extracted. A devitalized tooth, even if properly filled, because of a diminished blood supply is necessarily a point of lowered resistance to infection. I do not presume to pass judgment as to whether root-canals can or cannot be filled properly. In some instances it is mechanically impossible. To devitalize teeth is therefore dangerous, even in the hands of the most skilled.

As pointed out above, the occurrence of pulpitis in a sound tooth or in one whose root-canal is properly filled, speaks for the existence of a focus of infection in some other part of the body. Not too much should be expected from the removal of a focus, especially in chronic conditions, because a similar condition may be present in inaccessible foci and in others too small to be detected. Moreover, recovery may be made difficult by local tissue sensitivity or peculiar mechanical conditions, and living bacteria in a metastatic lesion may continue the process independently of the focal source. A focus is of importance not only as affording an entrance-way for bacteria, but also as a place where varying affinities may be acquired. Bacteria are exceedingly small, and may enter the blood without visible signs on the surface. We must not over-emphasize the mechanical factors and neglect the point of greatest importance—namely, the infecting power of the bacteria at hand.

The results detailed call for a closer affiliation of the dental and medical professions. The dentist of the future should not be isolated in a small office over a drug-store, his chief work being to devitalize and fill teeth without regard to the general health. Properly trained dentists should be a part of the public school system and hospitals, in which instruction in the care of teeth should be given. The dentist should be closely associated with a group of physicians so that patients may be given the benefit of a co-ordinate group of specialists with a minimum loss of time and expense. Moreover, it seems to me, these results call for a public health propaganda so that the people may be fully informed of the dangers to their continued health that arise from infected teeth, and how to avoid them. Prophylaxis should be the watchword.

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The Technique of Root Resection and Root Amputation.

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DENTAL surgery is, with increasing interest and profit, giving attention to the X-ray, conduction anesthesia, root-canal filling, root resection or root amputation. They are quite the foundation stones or backbone of sound dental surgery; each assists and is responsible for the others to a remarkable degree. Three of them have received careful and extensive attention at the hands of many men; the other, root resection or root amputation, has been largely left to the specialist and the expert. Expositions of the technique of these most valuable and successful operations are not found described so frequently in dental literature. While the majority have seen excellent radiographs, root-fillings, and demonstrations of conduction anesthesia, few have seen successful root resections or root amputations.

Root resection is the removal of a section of a root; root amputation is the removal of the whole or larger part of a root. These terms are neither arbitrary nor absolute, but quite accurately differentiate the two operations.

Root amputation is resorted to largely in cases of multi-rooted teeth whose roots have been exposed and the alveolus absorbed. Such roots, if not amputated, are a continual source of irritation, and because they are unprotected by gum and bone, accumulate either calculus or mucoid deposits. Such teeth are found most frequently associated with Riggs' disease.

Root resection is the means of curing that large class of cases in which chronic apical infection exists. Such cases are usually found to have a limiting wall made up of granulation tissue called *granuloma.* Again, in cases in which the pathologic destruction has extended until cystic degeneration has set in, if enough alveolus remains, it is necessary to resect the root or roots down to sound tooth structure in order to preserve the tooth. In the case of roots in which it has been found impossible to reach the apex and properly fill the canal, the canal may be filled as far as possible and the remaining part of the root resected to prevent future apical infection. In all cases where root resection is called for, the technique is about the same.

ROOT AMPUTATION.

After completing all necessary work on the tooth to be operated upon, such as filling the root-canals, placement of fillings, inlays, or crowns, a good radiograph should be taken of the tooth. After painting the gums around the tooth with iodin, a little novocain suprarenin solution may be injected locally. If the tooth is loose, it is advisable to brace it with a little modeling composition.* Select a crosscut fissure bur, place it in the handpiece, either right angle or straight, according to the location of the root. Insert the bur between the bifurcation, and with a slight sawing motion cut through the root in a slanting direction toward the occlusal surface. Having started to cut through in one direction, the bur may be removed from the cut, and then started from the opposite side of the root. When the latter is completely severed, it may be removed with a small pair of root forceps or root pliers, gently separating any adhering tissue with a knife. Any ragged pieces of gum are cut away with the gum scissors, and the socket painted with iodin. The part of the tooth from which the root has been amputated is smoothed and rounded off and polished with stones and disks.

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* Adair: "Practical Oral Hygiene, Prophylaxis, and Pyorrhea Alveolaris."

In some cases two or three blows of the mallet on a sharp chisel will amputate the root more quickly and neatly than can be accomplished with the fissure bur; or the bur may be used to start the cutting and direct the line of cleavage, and the chisel to complete it.

ROOT RESECTION.

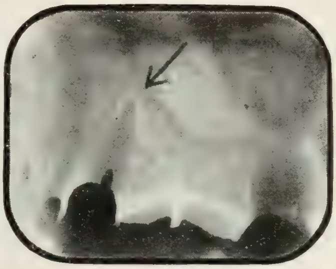
From anatomical considerations and accessibility, the upper and lower incisors are the teeth upon whose roots resection may be performed with least difficulty. They are, therefore, the ones recommended to be selected for root resection by those who are just taking up this work.

Resection of the upper and lower canines is a little more difficult; the upper second bicuspid and lower bicuspids are next in order, with due regard and care for the maxillary sinus and mental foramen, while the upper first bicuspids, the upper first molars, the lower first and second molars, and the upper second molars, range in difficulty in the order named. Then follow the upper and lower third molars, whose roots may be resected only under the most favorable conditions, and are therefore not suggested for this operation.

It is well to make and study cross sections of the jaws of a dried skull in the region of all these teeth. By this means a good idea of the anatomy may be gained, as well as a knowledge of the thickness of the bone about the teeth upon which this operation is performed.

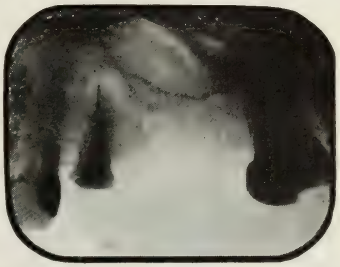
First fill the root-canals as far as possible with gutta-percha, and then procure a good radiograph to show the following conditions: How far the root-canals have been filled; the extent of the infection, and the size of the granuloma or cyst; or, to indicate the location of the perforation, also the relation of the root or roots to be resected to the other teeth and to any other important anatomic structure.

FIG. 1.



Apical abscess on upper right first bicuspid.

FIG. 2.

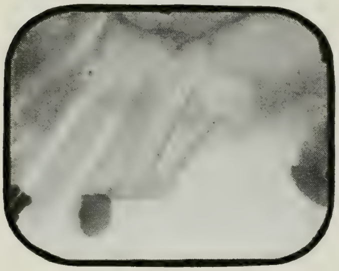


Bridge removed and root-canals filled.

ANESTHESIA.

Conduction or infiltration anesthesia with novocain and suprarenin is pre-eminently the anesthesia for this operation. Governed by local conditions—in the upper anterior teeth, centrals, and laterals—infiltration anesthesia or the infra-orbital injection in conjunction with an incisal injection may be used; on the upper canines and bicuspids, infiltration or the infra-orbital injection and anterior palatine and incisal injection, or locally on the palatine side of each root, and sometimes a tuberosity in conjunction with it. For the lower incisors, infiltration or a mental injection on both sides, or a mandibular injection on one side and mental on the other, should be employed.

Fig. 3.



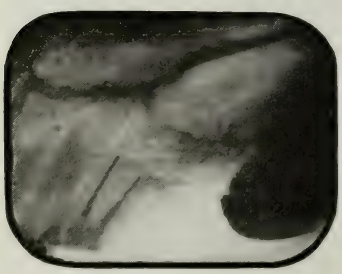
Buccal root resected.

Nervous patients may be given two bromural tablets from twenty minutes to half an hour before the injection.

TECHNIQUE OF ROOT RESECTION.

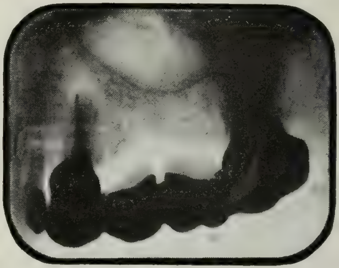
Having sprayed the patient's mouth with a good antiseptic solution or normal salt solution, sterile gauze is packed under the lips; for example, in the case of an upper first bicuspid, as far back as the molars, to prevent any saliva entering the wound. After the anesthetic has been given and the usual tests have been applied to determine whether or not it is having the desired effect upon the jaw, with the jaws closed the site of the proposed incision on the gum is painted with iodin. With a sharp knife a crescent-shape incision is made just below the level at which the root is to be resected, the center of incision being in the median line of the tooth. This incision should usually be about three-quarters of an

Fig. 4.



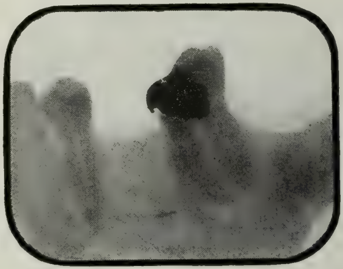
Palatal root resected.

Fig. 5.



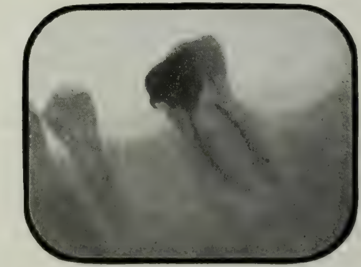
Bridge replaced and condition six months later.

Fig. 6.



Lower right second molar roots resected in Hôpital Français de New York, Passy-par-Veron (Yonne), France. (Abscess on both roots of lower second molar.)

Fig. 7.

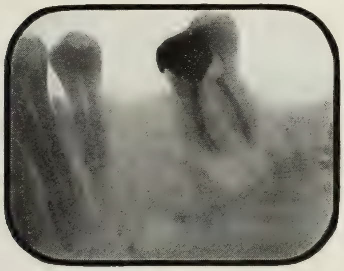


Root-canals filled.

inch in length. A periosteal elevator is then used to separate the periosteum from the bone toward the apex of the tooth for about three-eighths to one-half of an inch. A four- or six-pronged retractor is inserted well into the flap, and the flap held firmly up out of the way. Sterile gauze may be packed into the wound to clear away the blood and control the slight hemorrhage.

The outline of the root can now be seen. Chisels or gouges and mallet may be used to remove the outer covering of bone and uncover the root. This should be accomplished without danger of going farther than is necessary and destroying the landmarks. After the root is uncovered, if nature has not accomplished this by pathologic process, a space should be chiseled around and above the apex. The greater the pathologic destruction the easier will be this step of the operation. Sufficient space must be obtained so that when the buccal root is resected there will remain room in which to see, work, and remove the palatal root. Remember that we are working on a first bicuspid.

FIG. 8.



Roots resected.

Having cleared this space, the chisel is placed, bevel toward the apex, on a level with the plane at which the root is to be resected; with one or two sharp blows this apical section is severed, and may be removed with any suitable instrument; then the cavity is curetted and all pathologic tissue removed. It may require a little more chiseling to secure access to the palatal root, and to obtain room in which to see it and free it from any obstructing bone. Then, with the chisel at the desired level, two or three sharp blows of the mallet are given, and the palatal root is resected. This is removed and its cavity curetted of any pathologic tissue. The whole field of the operation should be syringed with normal salt solution, and then dried as well as possible for inspection. The sharp edges of the root-ends may be smoothed off with a surgical bur, and the original opening of the bone made smoother with chisels and curets. The wound is again syringed with normal salt solution, and dried with sterile gauze for inspection.

AFTER-TREATMENT.

There are two methods of treating such wounds. They may either be packed with gauze or sutured. This will depend largely on the condition of the wound and the extent of the infection, and sometimes the location. If it is decided to pack the wound, it is painted with a solution of iodin; novocain powder or orthoform powder or a mixture of the two may be put in the wound to allay any post-operative pain, and upon this should be tightly packed iodoform gauze. The first packing should be tight, as there is liable to be some hemorrhage when the effect of the suprarenin has worn off. Tight packing will also check the slight hemorrhage that accompanies work of this kind.

The patient should be given four to six trigemin capsules, two to be taken every two hours if there should be severe pain. The patient is instructed to apply a cold compress for fifteen minutes during each hour, to reduce or prevent swelling. The patient should also be instructed not to eat any meat for a day or two, and to take a saline cathartic the following morning. He should return in a day or two to have the packing renewed. The packing is then removed, and the wound irrigated with normal salt solution, painted with iodin, and then packed with iodoform gauze. The precedure is repeated every two or three days, using a shorter piece of gauze each time until the wound is healed, which will be in about three or four weeks.

The operation may be performed by the oral surgeon, and the after-treatment of the case carried out by the dentist referring the patient to him.

If it be decided to suture the wound, it is irrigated with normal salt solution and dried with sterile gauze, painted with iodin, and then freshened with a curet in order to get a good blood-clot. Then the crescent-shape flap is caught with rat-tooth pliers, and the edges of the wound are brought together in about three interrupted stitches with a circular needle carrying either silk or horsehair. Care should be taken that the needle includes sufficient tissue on both sides of the wound, so that the sutures will not pull out. The stitches may be removed in about four days.

Care must be taken that the roots on each side of the one operated upon are not injured nor the nerves devitalized. All instruments, gauze, and dressings must be absolutely sterile.

The instruments used in this operation are those designed for this work, or suitable instruments may be selected from among those known as mastoid instruments.

8 West 40th st.

Diagnostic Methods in Determining Feeble-mindedness.

By LOUIS E. BISCH, M.D., Ph.D., New York, N. Y.,
FORMERLY DIRECTOR OF PSYCHOPATHIC LABORATORY, N. Y. POLICE DEPARTMENT, ASSOCIATE IN EDUCATIONAL PSYCHOLOGY, COLUMBIA UNIVERSITY; VISITING NEUROLOGIST, NEW YORK CITY CHILDREN'S HOSPITAL AND SCHOOLS.

(Read before the Eastern Association of Graduates of the Angle School of Orthodontia, New York, November 25, 1916.)

THE term "feeble-mindedness" is used by many very loosely, and again many others have but a hazy idea of just what it implies. In England the term is restricted in its meaning to the highest grades of mental deficiency, while in this country it is generally used as a synonym of any degree of mental defect from idiocy up.

Because of its popular connotation feeble-mindedness has been selected as a caption to this paper, yet for purposes of exposition and discussion the term "amentia" seems more accurate and scientific.

"Ament," freely translated, means without a mind, and by it is indicated an individual whose mentality from birth is below par. He may possess potentials for intellectual development to some degree, but, although he may be improved, no amount of teaching or training will ever put him into possession of all his faculties so that he can compete on equal terms with his normal fellows. From a psychological viewpoint the three main grades of amentia are idiocy, imbecility, and moronity. From what might be called the clinical viewpoint, there are such types as hydrocephalus, microcephalus, cretinism, mongolism, etc., depending upon the physical and neurological signs exhibited, and each of these may further be classified psychologically as hydrocephalic idiot, hydrocephalic imbecile, hydrocephalic moron, and so on.

The insane—the psychotics—are frequently confused with the aments, yet the difference is very marked. Rightly speaking, one may say that a person with a psychosis was once normal, his intellectual faculties having already developed to a degree that he could and did take his place in society on an equal basis with others; but disease overcame him, the result being disturbed and disorganized thinking.

In amentia the neurons, because of inherent defect, never develop to capacity as they should; in the psychoses the neurons develop to capacity and functionate adequately, but something happens which upsets that adequacy. To liken the difference to a telephone system, in the ament there are too few wires or too little electrical energy to serve the whole city; in the psychotic there are sufficient wires and electricity but the "wires are crossed," and messages are sent to wrong stations. In the former it is a quantitative deficiency; in the latter, qualitative.

The terms "arrested development" and "retarded development" are also employed in clinical psychology, and again we find them confused with the terms feeble-mindedness and amentia.

To the writer it seems clearer to confine the diagnosis of arrested development to children born normal in all intellectual potentialities, but who, through trauma or disease with its resultant organic brain lesions, have been rendered aments. That is, a child may be perfectly normal, but at the age of six, for example, it receives a brain injury or contracts cerebro-spinal meningitis. What may happen is that, due to the thickening of adhesions of brain tissue, such a child develops but slightly in the mental sphere; often, in fact, retrogrades, and no matter how well it may be educated later, the organic changes in the nervous system are so great as to render the patient an ament, never being able to reach a normal mental state.

In retarded development there is simply a slowing-up of mental progress. These children have normal potentials for mental development at birth, but, usually owing to some physical defect, which acts like the brake of an automobile, while they advance and improve, it is with difficulty. Generally, the defects which slow up the mental growth are physical in character and remediable, and it is especially in this field of mental retardation that orthodontia has come to play so important a rôle. Among such remediable or improvable physical defects of special interest may be mentioned abnormalities of shape and size of the cranium, nose, lips, and tongue, saddle and V-shaped palate, small receding or large projecting jaws, irregular and malformed teeth, drooling, delayed primary and secondary dentition, etc.

PSYCHOLOGICAL TESTING IN DIAGNOSING AMENTIA.

In recent years so-called "psychological testing" has become one of the most important, if not *the* most important, aid in diagnosing amentia.

Since the causation and mental picture of the groups of conditions outlined above are dissimilar, the means of discovering their presence also would be unlike. Psychological tests are employed in diagnosing congenital amentia, arrested development, and retardation, and naturally they are at the same time an aid in evaluating normal intellectual status and precocity. Emphasis is placed upon the various mental faculties, such as powers of attention, memory, associative ability, motor co-ordination, etc., considered both separately and *en masse.* In psychiatrical examinations essential points are the presence of delusions, hallucinations, emotional tone, behavior reactions, etc. Clinical psychology is concerned largely with amentia, but, as in other sciences, overlapping takes place.

It is common practice to estimate an individual in terms of what he knows and what he does, and it is not astonishing that the vast majority of psychological tests deal in the main with these factors. The first and perhaps the most important and widely used are the so-called "tests of intelligence" (Binet-Simon; Ziehen; Yerkes-Bridges; Stanford revision of the Binet), while the next step was the development of "performance tests" (Healy puzzle; Knox; etc.). The general intelligence tests are scored in terms of years as correlations with the mental development of a child in school under ordinary educational conditions; in the performance tests, which consist of placing differently shaped pieces of wood in a frame, the scoring is made according to group ability rather than according to years. Both types of tests accentuate intellectual capacity.

However, the emotional side of an individual is equally important. Persons dealing with criminals are constantly impressed by this fact, for many a repeated offender measures normally according to intelligence and performance tests, although the emotional inadequacy presented is striking. Thus far but few attempts have been made to evaluate or register the emotions, and indifferent results have been obtained. In this connection may be mentioned the galvanometer, the plethysmograph, etc.

In differentiating between the intellect and the emotions it must be remembered that no fundamental difference exists that can be demonstrated scientifically. Thought processes are complex mechanisms, and in the same measure that we speak hypothetically of separate faculties —although such distinctly defined entities probably do not exist—so, for purposes of convenience, do we consider thoughts—intellectual products—as though they were units. Probably every thought possesses some feeling-tone, some emotion, despite the fact that the subject may not be conscious of the latter. The supreme difficulty of separating and estimating the influence of one upon the other seems at present insurmountable, but in a crude way the fact is taken into consideration when, for example, the attempt is made to place the subject at ease as much as possible before beginning tests. Except for a few other similarly rough precautions and observations, testing of the emotions remains a sadly neglected field of obscure research.

It seems perfectly natural that when the need for a scale of mental measurement other than school grading became apparent, attention should have been centered upon the individual's ability to use language. Spoken and written words enter into each person's everyday experiences, and upon his ability to use language in large measure depends his understanding, personal relationship, and control of his environment.

Professor Sante de Sanctis of Rome, Italy, devised a simple series of six tests by which he claimed a person's subnormality might be detected readily, but it remained for Dr. Alfred Binet and Thomas Simon of France to publish in 1908 a definite scale as a measure of intelligence in which language ability was accentuated. The scale was developed after three thousand school children had been examined. (In 1910 the Binet tests were translated and published in English by Henry W. Goddard of the Vineland Training School, New Jersey.) This factor of language in the Binet scale has since been criticized, and many revisions have been made, but its importance in the history of psychological tests depends mainly upon the fact that for the first time an attempt at standardization was made, and in consequence the conception of "norm" came into being.

DETERMINING THE "NORM."

For the most part there has been a failure of physicians, teachers, and social workers to comprehend exactly the nature and function of psychological tests and the meaning of "norm." Only to "standardized tests" may the term "norm" be applied, and by a standardized test is meant performances of intelligence or manipulation, or both, which have been found by experiment upon several hundreds of cases to be an objective measure of a certain degree of capacity. The whole theory and practice of standardizing tests is founded upon the concept of the "curve of distribution." No test possesses much value unless it is known what the normal response to the test is, and in this consideration should be included the age, sex, race, and social group to which the individual to be tested belongs. Binet's great contribution to clinical psychology rests upon the fact that after years of objective experiment he furnished a scale of norms to which the performance of any individual of a certain age can be referred and classified as normal, subnormal, or supernormal. Since his work a few investigators have followed his example, with the result that we now have additional tests more or less accurately standardized for age norms. However, the Binet scale remains still the most useful single instrument among mental tests.

In general, one may say that mental tests are never in and by themselves a means of final diagnosis. The interpretation of tests, an appreciation of the faculties involved, even when the tests are standardized, is most essential, and the manner in which the subject goes about it, whether interested, distracted, frivolous, apprehensive, etc., is of as much importance as what he actually accomplishes. This fact alone makes it imperative that persons performing tests should have at least a thorough working knowledge of pedagogical standards and psychological experimentation. Furthermore, decisive diagnoses should never be attempted unless the hereditary, pedagogical, psychological, and medical aspects of the case have been carefully considered and correlated. In the last analysis, diagnoses should be made preferably by persons combining a knowledge of these subjects with actual clinical experience in psychiatry.

It must be remembered that mental tests reveal only the mental status of the subject at the time of examination, and they do not indicate what the cause of the abnormality is. To be sure, an expert who knows abnormal as well as normal psychology, and who has examined hundreds of defectives and pyschotics by means of mental tests, does come to recognize certain differences in reaction by which in a percentage of cases he can infer whether an individual is suffering from amentia, dementia, aphasia, etc. But, in spite of this, since we have at present no tests for making positive differential interpretations, no final diagnosis should ever be attempted, even by the most expert, on the basis of mental tests alone.

Thus the real function of standardized psychological tests is to objectify and measure the degree of intellect which an individual can command at the time of examination, and to clarify the discussion of his case by referring his mental status to an objective scale which all competent and informed persons can understand definitely. Their great value consists in liberating the diagnostician from the old-time vagueness and uncertainty which was the inevitable result of purely subjective standards.

This is especially true as regards high-grade defectives. It is only since the development of psychological norms that the concept of "moron" came into existence among workers with aments. When Binet made it possible to tell in an objective way just what normal individuals of each chronological age can do, it was found that many adult individuals, not formerly recognized as feeble-minded, were, as a matter of fact, unable to perform tasks above the capacity of average ten- and eleven-year children. They were not imbeciles, yet clearly they were not of adult mental capacity. In this manner the term "moron" developed.

Although one of the greatest needs in clinical psychology is for standardized tests, a large number of unstandardized tests now in use are not without value. These tests afford an opportunity to obtain a rough idea of an individual's general intelligence and methods of work along certain lines. If interpreted conservatively they possess worth, especially when given in addition to standardized tests as a means of obtaining further data.

To correctly standardize even one test is a long, laborious, painstaking task. In comparison it is much easier to invent a new one. Therefore one can understand readily why at the present time clinical psychology is somewhat "test-ridden." Each year numbers of new tests are brought forth, unstandardized —unproved, in other words—and often by persons untrained in psychology or experimentation. Perhaps in future years entirely new sets of even standardized tests will be in common vogue. However, one would hope rather that after a time a comparatively few but sufficient number of tests will have been standardized, so that all kinds of conditions of mankind can be measured with fair exactitude.

To perform a mental test takes time, and this is more true of intelligence than of performance tests. An hour is a fair average. Subjects should always be made to feel at ease and some sort of *rapport* established with the examiner before the actual testing begins. All subjects cannot be approached in the same manner. To begin with too simple a test makes one person disdainful, while another becomes discouraged when tests too difficult are presented. Give as many tests as possible in order to obtain various points of view, but do not crowd and fatigue.

768 West End ave.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

Amalgam Tooth-filling Aspirated into Lung During Extraction.

By CHEVALIER JACKSON, M.D., Philadelphia, Pa.,
PROFESSOR OF LARYNGOLOGY, JEFFERSON MEDICAL COLLEGE.

MISS C., age twenty-six, while under gas anesthesia, aspirated an amalgam filling into the left lung. The crown of the tooth, a lower molar, was a mere shell, and crushed under the grasp of the forceps. The dentist, a very skilful man, when he discovered that the large amalgam filling was missing, asked the patient to have a radiograph taken. As she had no distressing symptoms she thought this to be unnecessary. Severe coughing paroxysms and sweating supervened; there was neither hemoptysis nor expectoration. The dentist then took the patient to Drs. Vanderhoof and Hutchinson, whose findings led them to believe there was a foreign body in the lung, and they joined the dentist in insisting upon a radiograph. The radiograph (Fig. 1) showed clearly the filling in a posterior branch of the right bronchus. The dentist then brought the patient to the writer for bronchoscopy.

EXAMINATION.

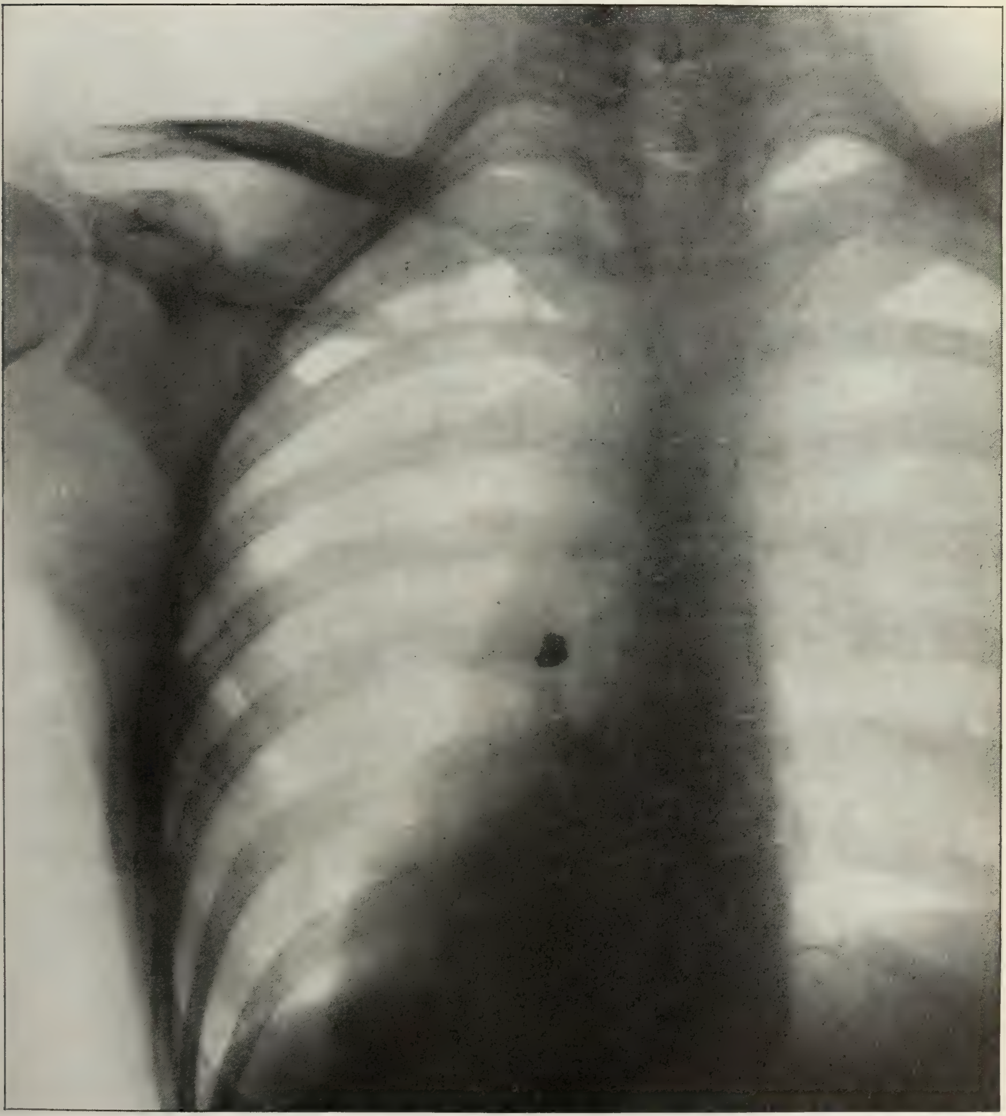
The following is an abstract of the report of Dr. J. P. McKelvey's physical examination:

Patient looks exhausted, tired, apathetic. Breathes easily (30). No respiratory distress. Skin pale. Contour of chest symmetrical; expansion slightly diminished on left side posteriorly. Vocal fremitus practically absent over lower part of left lower lobe posteriorly and in axilla. There is dulness, beginning in the mid-scapular line about one inch below the angle of the scapula extending toward spine, increasing to definite flatness at base, with increased resistance to percussion. Over this area there is progressive diminution in intensity of voice and breath-sounds to base. Voice and breath-sounds are normal in character. There are occasional sibilant and dry subcrepitant râles over this area and in axilla on coughing. Over the right chest in front, extending from clavicle to third rib, from sternum to mid-clavicular line, there is hyper-resonance with increase of whispering voice and breath sounds, and an occasional coarse dry subcrepitant râle. Chest is otherwise negative.

BRONCHOSCOPY.

Under local anesthesia I passed the bronchoscope through the mouth, and found a diffused left bronchitis. The filling was found tightly embedded in the swollen mucosa and partially hidden by an annular edema of the invaded bronchial wall. The filling (Fig. 2) was disimpacted with a pair of side-curved bronchoscopic forceps and extracted. The patient left for home the next morning, and in a few days the cough had entirely disappeared. The patient has since remained perfectly well. The bronchoscopic removal, including the application of the local anesthetic, required seven minutes and fifty-four seconds.

FIG. 1.

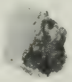


Radiograph showing an amalgam filling in the lung of a woman of twenty-six, the filling having been aspirated during extraction under gas anesthesia.

REMARKS.

While the accidental aspiration of a filling or a fragment of a tooth during extraction is a very rare accident, yet it has occurred in the hands of the most skilful men. While the author confesses his utter ignorance of the technique of extraction, it has seemed to him that the position of the patient and the stertorous respiration of gas anesthesia favor such an accident. Be this as it may, the fact that aspiration has happened in the hands of the most skilful exodontists would seem to entitle the subject of precautionary measures of some kind to consideration. If there be the slightest reason to suspect—by reason of the loss of part of a tooth or filling or instrument—that a foreign body may have entered the lung, the services of a radiographer familiar with chest work should be obtained. A portion of a tooth, or even a whole one, requires an excellent radiograph to show it, if it contain no metallic filling. Fluoroscopy, if negative, is valueless. No dependence should be placed upon the absence of symptoms, because in most cases of foreign bodies, other than vegetable substances, there is a quiescent period during which there are no symptoms referable to the air-passages, and even cough may be totally absent. While there is no need for desperate haste, yet as a rule, the sooner bronchoscopy is done the easier the removal will be.

FIG. 2.



Shows the filling removed from the lung by bronchoscopy through the mouth under local anesthesia.

N.E. COR. 17TH AND WALNUT STS.

Apical Toxic Focus in General Infection.

By EDWIN SHOEMAKER, B.S., D.D.S., Philadelphia, Pa.

(Read before the Academy of Stomatology of Philadelphia, February 27, 1917.)

WITHIN the past few years, since the use of the X-ray has somewhat widened the scope of the usual dental practice, numerous essentially medical cases have been reported in which general conditions of a baffling and intractable nature have been greatly improved or indeed entirely corrected by judicious dental intervention. In apparently incurable cases with obviously toxic origin the results obtained by the simple removal of a tooth or amputation of an apex often have been as startling as they were unhoped-for. The inference—at present enjoying little more dignity than mere theory—is that the focal area from which the irritating cause of the important general condition originates, either as actual bacterial migrations or toxins of bacterial metabolism absorbed into the circulating fluids of the body, is to be found at the apex of a tooth.

However, despite the numerous examples of the close connection between the diseased tooth apex and the general systemic condition that appear in our magazines in increasing numbers, there are many who still feel that it behooves us to move forward cautiously, and not allow assumption due to appearances to lead us beyond the conservative state of mind in our attitude toward this fascinating theory, until such a time as this connection may be said to be proved by constant authentic clinical repetition and scientific research. For from the internists we learn that it is a characteristic of arthritis, myocarditis, "muscular rheumatism," nephritis in its various manifestations, etc., that the cure may be indefinite, and not effected at a certain time by a specific method of treatment, as is the case in not a few other infectious diseases. Many elements, they tell us, often enter into the cure if such takes place.

There are other men among us who do not accept the theory at all, and who, knowing the high percentage of teeth with rarefied areas that the radiographer finds, ask us how the human race has been able to survive at all.

From what is definitely known of focal infections in other parts of the body it is not impossible that a toxic focus responsible for the condition may be located at the apex of a tooth; indeed, given the right circumstances nothing would seem to be more possible. An instrument point dipped first in a streptococcus culture could hardly be thrust into the arm without danger, because it would carry the micro-organisms into the blood. The open root-canal can as easily transmit bacteria; or, more likely still, the improperly filled canal may become a protected space in which a non-hemolytic strain carried by the blood stream may enjoy unrestricted growth, and extending out into the periapical alveolar structure, be limited only by the vital resistance of the individual host.

Professional men as a group are noted for the readiness with which they embrace new theories and methods of practice. It may be dissatisfaction with older ideas that urges them to the change; it may be, and probably usually is, enthusiasm for their subject that inspires them. Dental practitioners have not differed from the others in this respect; our history is filled with episodes marked by enthusiastic adoption of novel procedures and theories. The wave passes on, and the new idea recedes from a position of overweening importance to assume its proper place, and is absorbed into the permanent methods of practice if it has good in it, or discarded if it has not.

The theory of dento-apical toxic foci as the cause of general infection has been advanced by the medical profession in much the same enthusiastic manner that tonsil infections were some years ago, and as other new theories have been. In many classes of ailments, radiographic examination of the teeth has become part of the routine in the search for the cause.

Dentists, however, have not shown quite as much zeal in pursuing the subject—principally, perhaps, because the loss of a certain number of teeth is often necessarily involved. It being the dentist's basic idea to conserve tooth structure, the difference in attitude of the two professions becomes obvious. Doubtless, also, there has been some lack of information among us, and possibly a little too much skepticism. To many of us it has seemed very much as though the claim were suddenly made that hair of a certain particular kind was responsible for degeneration of the intellect. We thought we knew almost all about teeth; we felt sure of them, as it were.

Despite the fact of its having been assumed and promulgated by the medical men, the question of dento-apical infection is essentially a dental one. The dentist has the history of the suspicious tooth; he can diagnose its condition by the symptoms it manifests, or, lacking symptoms, can definitely locate it with the X-ray. Because of his understanding of the normal position and appearance of the teeth roots in the alveolar structure and his intimate knowledge of their pathology, he possesses an advantage over his medical brother in interpreting the radiograph. Unquestionably the final disposition of the case should be made by the dentist. Therefore, skeptical or not of the theory, we must be prepared to assume this responsibility; we must be competent to decide in the cases that come before us, must determine which teeth are suspicious and which are not. We should be conservative, in order that useful and innocent teeth are not needlessly sacrificed, but also we must be able to protect our patients from the continuation of apical infection where it does exist. The question is undoubtedly one of considerable importance.

To illustrate this importance I will report in some detail certain cases with which I have been concerned. They are all of a general type of primary infectious foci with widely differing systemic manifestations.

CASE I: TOXIC ARTHRITIS.

In June 1915 the patient, a woman, forty years of age, large, robust, strong and healthy, presented for dental treatment. The upper right and left first bicuspids had been extracted and the occlusion restored some eight or ten years previously with single abutment bridges, using the second bicuspids as posterior attachments, the abutments being in the form of gold shell crowns and lacking any anterior support. From the standpoint of appearance and comfort the bridges had been satisfactory, never having caused any trouble of which the patient was conscious. The bridges were slightly loose, and in the routine examination of the mouth radiographs were made of the abutments. (Figs. 1 and 2.) The root-canals are seen to be unfilled. At the apex of each is the characteristic appearance due to local removal of lime salts from the periapical alveolar bony structure, at present usually considered diagnostic of an area of reduced resistance if not actually of a subnormal growth of non-hemolytic streptococcus or other organism. Such a condition presents at least a possible toxic focus. There was no discoverable external evidence of this pathological state, no sinus, discomfort, swelling, or history. Being convinced of the importance of protecting the patient against a possible serious outcome, the situation was explained to her, and she was urged to have the second bicuspids removed. In extenuation of this rather extreme stand let it be noticed also that the bridges were mechanically unsound, and would of their own accord eventually loosen and become useless. Curiously enough, arthritis was principally mentioned as a threatening possibility. However, due to the very natural feeling of confidence in restorations that for years had rendered complete satisfaction, the patient was not sufficiently impressed to follow the advice given her.

Fig. 1.

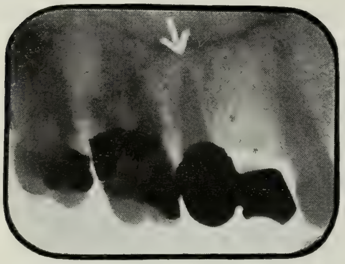
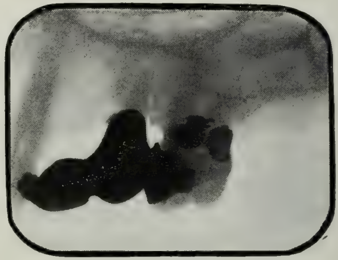


Fig. 2.



Five months later I was called to a hospital at the request of the patient. The resident physician informed me that she had been confined in the institution for four weeks. She was suffering with a severe inflammatory condition of the right knee, which was acutely painful to manipulation or change of position, and entirely disabled the patient. The condition was diagnosed as toxic arthritis, but had failed to respond to medical treatment. The patient's history was negative as to infectious disease. It was decided to remove the left bicuspid (Fig. 1), as being apparently the principal offender. This was done at once. The apex of the root presented an appearance characteristic of the local condition of liquefaction, identified by the shadow area around or at the apex as pictured by the X-ray film. The extreme tip was eroded and spiculated, as if the root-end had been dipped in acid, and the sides of the root for a short distance were coated with deposits of calculus, which adhered tightly, showing even more plainly after boiling in a weak solution of sodium carbonate. Within two weeks after the extraction of the tooth the patient was walking, though with difficulty. The knee was no longer painful, but still somewhat stiff. The right bicuspid was removed some months later. Shortly afterward she resumed her normal activities, the joint gradually losing its stiffness. There has been no return of the condition.

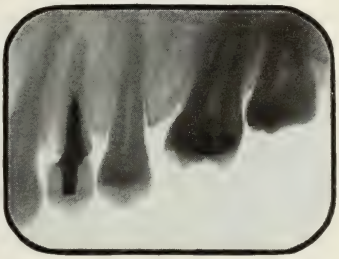
The original attack followed closely upon a period of a month's extreme over-exertion and lack of proper rest, together with continued anxiety engendered by the severe illness of a sister.

CASE II: ACUTE TOXIC IRITIS.

Late in June 1915 (the 25th) the patient came to the office, accompanied by a trained nurse, for X-ray examination. Her attending ophthalmologist previously described the condition to me: A woman, twenty-five years of age, of average stature, history negative in regard to infectious diseases, had been seized with a sudden severe attack of acute toxic iritis. Within the course of five days after the onset the left eye had lost its vision, and the right was rapidly following the same course. Headache was severe and continuous, practically prohibiting sleep or rest, and the temperature was 101° to 102°. With the exception of the teeth, a thorough examination had been made for toxic foci, with negative results. The physician was impressed with the urgency of the case, stating that if the cause were not discovered and removed within a very few days the impairment of vision would be at best most grave, with an extreme likelihood of permanent blindness.

The mouth was an unusually well-appearing one, no pyorrhea, gums healthy, no retained roots or broken-down teeth, and but few and moderately sized restorations. There was one crowned tooth, the upper right first bicuspid. It had been crowned for some nine years, and had always been entirely comfortable and satisfactory. On examination there was no discoverable fistula, nor was there any soft spot in the process over the root apex such as is sometimes claimed to always exist when there is a liquefied area under the external plate. A radiograph was made of this region (Fig. 3). The root-canals were unfilled at the important apical half. A plainly marked liquefied area appears surrounding the apex. The tooth was removed forthwith and the socket curetted and sterilized with a strong solution of iodin in benzol. The root presented the typical aspect of that of the previous case, namely, eroded tip and deposit of calcareous material around the portion shown in the radiograph surrounded by the rarefied area.

Fig. 3.



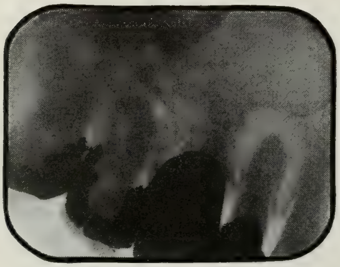
Two days later the patient's condition had changed for the better to a marked degree. The distressing symptoms of constant headache and pain in the eyeballs had subsided, the temperature was normal, and the ophthalmologist reported that the local eye condition was so much improved that he felt convinced the irritating toxic focus had been found and removed. Within five days the eyes were pronounced out of danger. Complete recovery ensued without incident. Six days after the first visit the patient came to my office again. Her appearance was in such striking contrast with that of the earlier days as to make one wonder at the possibility of such an alteration. It seemed to all of us who were connected with it that this was indeed a remarkable case.

It is interesting to note that in this instance, too, the acute toxic attack followed shortly after an unusually severe period of overwork and lack of sleep.

CASE III: ACUTE NEPHRITIS.

The history as reported by the patient's dentist and physician is as follows: The upper left second bicuspid suddenly became sore and loose, and in the course of a few days exhibited symptoms, except that of much pain, of apical abscess. There was some submucous swelling over the bicuspid root. No pus was evacuated; the tooth lost its tenderness within a few days.

FIG. 4.



As nearly as can be determined a week afterward the patient's physician was called in haste to attend him, as he had suddenly fainted. He was found in an alarming semi-comatose, stuporous condition. After examination it became evident that he was suffering from acute uremic poisoning, presenting every appearance of a toxic nephritis. The urine was immediately examined, and albumin and casts were found to be abundantly present. The acute condition was relieved by indicated medication. The next day the abscess in the mouth was recalled; an incision was made and a large amount of pus was evacuated. During the next week urine examinations were made daily, and no appreciable decrease in content of albumin and casts was found. The patient was then sent to the writer for X-ray examination. The apex of the upper left second bicuspid tooth (Fig. 4) shows a sharply marked liquefied area with a plain line of demarcation separating healthy from unhealthy bone. The large shadow just distal to the apex is a gold crown on the molar. The bicuspids were so much out of line that in order to show them the molar is thrown out of proportion. Removal of the tooth was strongly advised. This was done. The daily urinalysis markedly changed forthwith, the casts and albumin diminishing almost immediately. Within two weeks after the extraction of the tooth the report was negative, and the patient was dismissed by the physician as cured.

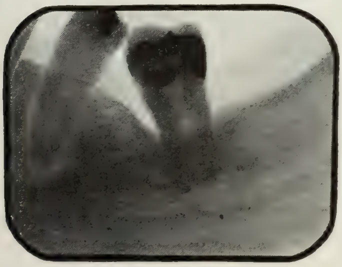
CASE IV: CHRONIC NEPHRITIS.

The medical history of the case is as follows: In January 1916 the patient, who for twenty-five years had been in constant robust health, was seized with a severe attack of tonsillitis which confined him to his bed for two weeks. During this time there was evident a slight uric acid diathesis, so-called "rheumatic infection." Recovery from the acute attack was not followed by a return to the normal state of health. Unusual weakness and susceptibility to fatigue and the loss of twenty-five pounds in weight within six weeks kept him under the physician's observation. Early in May 1916 urinalysis revealed albumin and plentiful fine granular and hyaline casts; sp. gr. 1028. Corrective medical treatment was instituted, but without noticeable result. In June the urine showed sp. gr. 1028, albumin and the same casts.

On June 27th the patient came to my office, during the absence of his dentist, for advice regarding a swelling in the lower jaw. Low on the process in the lower right first molar region was a hard, pronounced, apparently subperiosteal swelling; the mucous membrane was not inflamed, and was painless even to pressure. The first molar was somewhat loose, but not at all tender to touch; the second bicuspid was missing and the first bicuspid was without symptoms of any kind. The swelling had made itself evident by appearance only about a week before. It had not been at all painful.

A radiograph was made of the region (Fig. 5), strong counter-irritation employed, and the patient asked to report later. The radiograph showed a rarefied area about the bicuspid apex; the molar exhibited nothing of a definite nature, the gum along the mesial aspect being in close and apparently normal contact with the root. Two days later the condition had made itself a little more plain. The swelling was quite pronounced; the molar was looser and somewhat tender to percussion. The bicuspid still exhibited no symptoms.

FIG. 5.



At this visit the patient was asked his general condition, and nephritis, the history of which is outlined above, was mentioned. The bicuspid was the more suspicious tooth in this connection, yet the molar was the one apparently responsible for the subacute abscess condition in progress. Both teeth were eminently useful, there being no other bicuspid or molar in the lower jaw on the right side. After careful consideration the patient was advised to have both teeth removed, despite the loss of masticatory function involved. This was done on the same day, June 29th.

The medical history now continues: July 15th, urinalysis shows casts and albumin without much alteration. Early in September a change became evident. The urine showed sp. gr. 1010, very slight albumin, and a few casts in a large field. The patient had returned to almost his normal weight, was greatly improved in general health, and could work without abnormal fatigue. In October the urinalysis showed sp. gr. 1012, albumin negative, and one cast in a large field—a negative report. Since June there had been practically no medication, and the patient had had but a short and unimportant vacation. After the October examination he was dismissed by his physician as cured.

Among other things it is interesting to speculate as to the cause of the rarefied area of the apex of the bicuspid, and though it does not show plainly in this particular radiograph, the abnormal condition in the molar periapical region is clearly evidenced by the roughened dentin. Both teeth were without deep restorations, had no cavities, and apparently sustained no more that the usual masticatory stress. There was no history of undue sensitiveness to temperature changes or soreness to mastication at any time. The molar leaned mesially, due to previous extraction of the second bicuspid, though not as much as the radiograph makes it appear. It may have been somewhat loose in its alveolus, and so produced at the apex an area of slight though continued irritation, with consequent reduced resistance. The patient was under my observation but three days, hence the previous condition of the molar in this respect cannot be described.

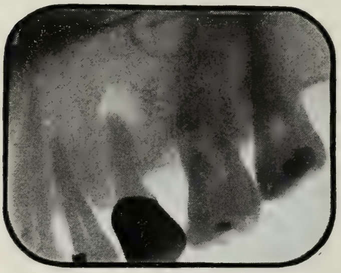
Before closing the account of this case it is to be noticed that although a period of physical strain or over-exertion is not reported as preceding the toxic invasion, a severe attack of tonsillitis did occur with a continuance of the need of medical care up to the time when diagnosis of nephritis was made four months later.

CASE V: TOXIC MYOCARDITIS.

The incipient stages in this case are similar to those of case IV. In January 1916 the patient had a severe attack of tonsillitis that confined her to her bed for practically two weeks. On recovering she returned to her work as manager of a department in a large retail store.

After a month she was forced to give up her work because of general weakness and shortness of breath. Her case was diagnosed as myocarditis. She was sent to the hospital, principally to get complete rest. During this period (six weeks) her pulse ranged from 90 to 130 and 140, her blood pressure was about 110, and she lost almost twenty pounds in weight. Complete rest and relaxation was expected by her physician to accomplish much. In these cases improvement almost always follows such treatment unless it is caused by the presence of a toxic focus. There was practically no change in her condition. She left the hospital after six weeks, and made an effort to resume her work. She was successful but for a few weeks, and had to return to her home. She still suffered from weakness and shortness of breath on the slightest exertion, and continued so up to the last week in August.

Fig. 6.



About that time the upper right bicuspid region became unsettled, with faint neuralgic pains occasionally, and a sense of fulness. Her physician sent her to me for X-ray examination on October 1st. The upper right second bicuspid was crowned with a gold shell. It was not tender to percussion or pressure, and but slightly looser than the adjacent teeth; there was no fistulous opening or swelling of the mucous membrane. A radiograph was taken (Fig. 6). There is no root-canal filling, and a distinctly outlined rarefied area appears at the apex of the root. The tooth was removed the next day. The apex presented the typical appearance previously described, the calcareous deposits being more marked, but the erosion of the dentin not so marked as it was in the teeth removed in the case of arthritis (Figs. 1 and 2) and nephritis (Fig. 5).

Improvement of the myocarditis was almost immediate. Within a month the pulse dropped from between 90 and 130 down to 75, and the blood pressure rose to 128. In two months the patient had gained twenty pounds, and her shortness of breath, weakness, and other symptoms had entirely disappeared. Her general improvement was so marked that the physician considered her cured.

It might be well to call attention to a fact already quite obvious. With the exception of the molar and bicuspid teeth in case IV, the pulp chambers of which had not been opened into, in all the teeth described in the cases reported no attempt had been made to fill the root-canals, at least not with an enduring material. After extraction the teeth were all opened, and the canals were found to be as lacking in fillings as the radiographs represent them. It could not be determined, of course, whether the canals had been made aseptic at the time the crowns were cemented in position, useless as that procedure is when proper filling is not immediately instituted. The liquefied areas present the appearance of having been at the respective apices for a number of years. Such complete destruction of bone as is shown could hardly take place in a short space of time. To speculate again, it might be said that a colony of non-hemolytic bacteria had grown there, the unfilled root-canal acting as the culture tube, kept within certain definite boundaries and without deleterious effect by natural resistance, until such a time as that resistance was decreased, with a lowering of general body tone, by a period of overwork, an attack of tonsillitis, etc.; then growth is stimulated, the bacteria increase in virulence, and express their toxicity in the form of serious disease.

A number of other cases have come under my observation in which the removal of teeth apparently has accomplished much in alleviating, if not actu-

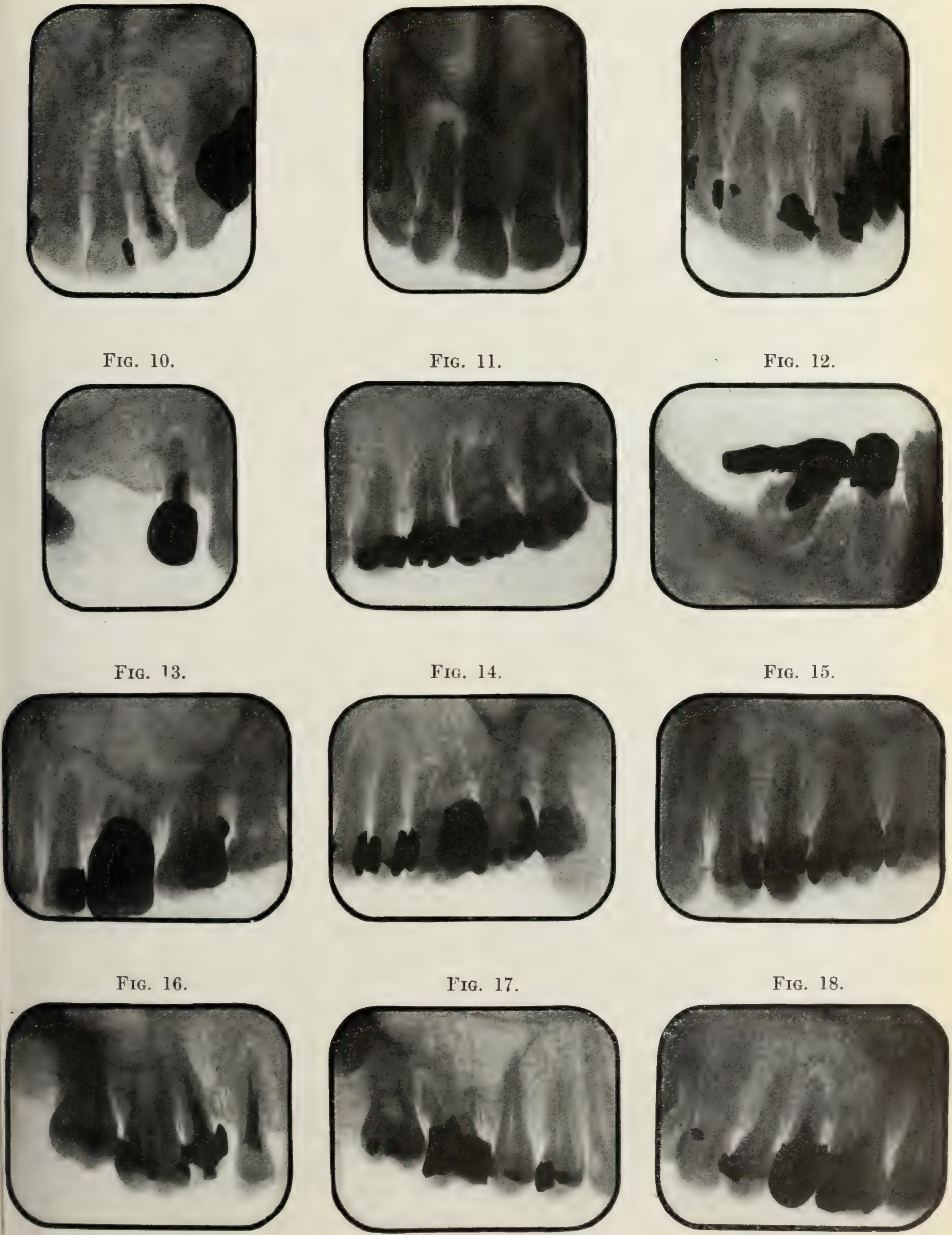


FIG. 7. FIG. 8. FIG. 9.

FIG. 10. FIG. 11. FIG. 12.

FIG. 13. FIG. 14. FIG. 15.

FIG. 16. FIG. 17. FIG. 18.

FIGS. 7 TO 18: Apical necrotic areas in apparently healthy subjects.

ally curing more or less serious conditions. The histories and diagnoses, however, are not as definite as those reported above. In the main they have been rheumatic troubles. But more evidence hardly need be detailed to prove the case—if proof, indeed, be necessary. Despite the hesitancy many may have in accepting the theoretical explanation of the mechanics of the infection, despite the conservative attitude we should assume in diagnosis in order that teeth may not be needlessly sacrificed, it cannot be seriously questioned that a diseased apex may—I say, *may* act as the primary focus in infectious disorders.

Face to face with such a possibility, what can we do? There are several considerations that interfere with peace of mind when the object is contemplated. Given an infectious disease of probable focal origin, there is no way definitely to ascertain whether the cause is dental. Even with rarefied areas showing at apices in radiographs we cannot be certain that we have located the causative factor. Lastly, the suspected teeth are almost always eminently useful from the dentist's standpoint, and he instinctively rebels against mutilating the masticatory apparatus.

However, it would seem that all the difficulties may be met in one way. Given a systemic infection, it is our duty when called in by the physician to do what we can to alleviate it. If there is a possible toxic focus in the mouth, be it pyorrhea pocket, discharging sinus, or rarefied osteitis at a tooth apex without external outlet, it should be eradicated; and this even though we do not know whether it is a causative factor, and despite the loss in masticatory surface that sacrifice of the tooth entails. Of course, the diagnosis should be carefully made, and normality and a pathologic condition not be confused. Fortunately, with the improvement in X-ray technique, it is now almost always possible to show rarefied areas where they really exist.

Another difficulty that confronts the student of this subject is the question as to what disposition should be made of the numerous teeth with rarefied apical areas that appear in the mouths of healthy persons. With but a modest experience in dental radiography the number discovered is astounding to a degree. In appearance they are the same as those that have been shown to be the primary cause of infection. (See Figs. 7 to 18.)

In these cases, how do we know that we have not simply taken the picture before the disease occurs instead of afterward? How can we tell whether or not these areas are potentially infective? Unhappily, there is no way to tell. Here again our course must be guided by careful judgment. The way in which various operators treat this question accurately reflects the seriousness of their attitude toward the whole matter. Until scientific investigation and clinical experience have developed our knowledge it is hardly safe to lay down a definite rule.

Many feel that the rarefied areas should be eliminated whenever located—and, if possible, by conservative means. Ionization may help us. Root amputation where practicable is always successful in removing the area. In molar teeth the only choice in the majority of cases seems to be extraction. Fortunately, however, the subject is still so new that the study of curative methods may be said to have just begun. Some means less extreme and crude than extraction will undoubtedly be found by which the menace of the rarefied area may be obviated without loss of masticating surface.

2011 Chestnut st.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

Consideration of Some of the Problems and Details of the Operative Side of Bridge Construction.

By JAS. KENDALL BURGESS, D.D.S., New York, N. Y.

(Read before the Maryland State Dental Association, Baltimore, June 1916; also before the Eastern Dental Society of New York and the First District Dental Society of Detroit.)

I MAKE no apology for bringing to your notice matters pertaining to restoration. In a number of recent meetings speakers, discussing remarks of my own or of others, have said that their interests were not primarily in these matters but in what they considered the more important work of hygiene and sanitation, by means of which it is hoped to establish immunity to the evils which at present are responsible for the conditions that make restorations necessary. Perfect prophylaxis is the goal of dentistry, and its attainment the dream and the hope of every true member of the profession, but as yet it is only a dream. The conditions that necessitate the work of restoration, though neither of our making nor our choosing, and whether the result of ignorance or neglect or a combination of circumstances, are very stern and prevalent facts, and while working out our dream of perfect mouth conditions we are called upon to deal with the reality of very imperfect ones. Our very presence in the profession places upon us the responsibility of meeting these conditions in a manner that will tax all our faculties, physical, mental and moral, in order that we may render a service commensurate with the dignity of a noble profession and with the requirements of the human organism, and bring it within the reach of the largest possible number whose needs and requirements only the dental profession can supply.

DENTISTRY A COMPOSITE PROFESSION.

Dentistry is a composite profession. Perhaps no other calling demands of its followers greater variety in the matter of intellectual attainments and physical accomplishments. While not requiring, perhaps, the breadth and fulness of knowledge in any of these subjects necessary to one following them exclusively as a calling, the dentist, in his highest development, must combine within himself some of the special and peculiar mental and practical qualities and qualifications that belong to the surgeon, the engineer, the artist, and the artificer.

Thus we have what, for the purposes of our study, we shall call a quadruple professionality. It is not the purpose of this paper to enter into an exhaustive analysis and discussion of these several activities in their general applications, nor even as they apply to all phases of dentistry, but to examine somewhat into their functions and the particular bearing of each as it relates to the subject under consideration, namely, the operative side of bridge construction. The duties of each are clean-cut and individual, and while they are all parts of one harmonious whole, I believe we shall be able to get a clearer conception of the value and importance of each of these parts if we consider them for the moment as four separate entities, each with his particular duties and responsibilities with reference to a given case, but having a mutual dependence and obligation, a common pride and material interest in the finished product. We have, then, within one personality, the dental surgeon, the dental engineer, the dental artist, and the dental artificer. Let us take them in the order named, and study in some detail the responsibilities, the functions, the duties of each, and discover if possible the relation of each to the others and to the whole.

THE DENTIST AS A SURGEON.

We must give the surgeon first place in our considerations, because his efforts have a larger and more direct influence upon systemic conditions, and because the systemic welfare must always outweigh in importance any purely local considerations. It should be the moral obligation of every surgeon to conserve vital and normal tissue to the greatest possible extent, and to interfere with normal function in the least possible degree commensurate with successful effort to relieve or to mitigate pathological and abnormal conditions. This responsibility is no less binding upon the dental surgeon. He must be both consultant and operator; upon him falls the responsibility of the welfare of the teeth and tissues in the field of operation and those relating to it, and, indeed, of the whole human organism so far as it may be influenced by the status of these parts, from the physio-pathological point of view. His function is to place the field as nearly as may be in a physiological condition, and following this, by his advice and instruction to his *confrères,* the engineer and the artificer, as well as by his own operative efforts, produce results that in themselves shall be prophylactic, not merely as it relates to oral cleanliness, in which sense we have come so to abuse a good word, but in the broader sense of preventing, as far as their influence extends—and more especially not themselves being instigators of—pathological conditions.

Accurate knowledge of morbid conditions and abnormal relations is the first requisite in any intelligent effort to relieve such conditions. The surgeon's first duty, therefore, is to investigate the field of operation and its environment, and by every means at his command acquaint himself, as far as possible, with the character and condition of each tooth and its retentive and surrounding tissues, and if there be lesions, to discover their nature and extent and their bearing on the retention of the tooth or root. This will include, of course, observation and examination for caries, erosion, fracture, defective fillings, or other defects, congenital or acquired through deterioration, accident or mutilation, their number, location, area, depth, the proportion of the tooth crown or root so affected, and their effect, certain or probable, upon the pulps in vital teeth; the condition of the pulps in vital but defective teeth and of the contents of the pulp chambers and canals of teeth suspected or known to be non-vital. He must also observe any instability of the teeth, its degree, and whether it is due to elongation or to deterioration or partial destruction of the retentive tissues, and if the latter, whether it is due to trauma or to pathological processes; any superficial inflammatory or suppurative condition of the soft tissues and its cause; the presence of tartar or other accumulations on the teeth; artificial crown or bridge abutments or protruding cervical margins of fillings injuring or menacing the vascular tissues; whether the teeth are too widely separated, permitting the crowding of fibrous particles of food into the tissues, and the presence of fistulæ or other evidences of deep-seated morbid conditions. He must by careful exploration determine the extent and the depth of all pyorrhea pockets, the amount of tissue lost through the destructive process of pyorrhea, and the condition of that remaining; and, last but not least, he must make radiographic examination to determine the conditions that obtain in root-canals and in the periapical spaces of teeth suspected or known to be non-vital.

I am seriously of the opinion that the time has come when no man whose ideal is to serve the best interests of his patients can afford to deny himself and his patients the benefits of the radiograph as a diagnostic aid. With increasing knowledge of systemic disturbances due to conditions in the oral cavity and its environment, there comes increasing responsibility to the dentist; diagnosis has become correspondingly important and difficult, and no man is excusable for working in the dark when light is to be had.

Having completed examination of the parts individually, the surgeon must study his findings in their relation to one another and in their bearing upon the prospective restoration. His next service becomes the institution and carrying out of such corrective measures as are indicated by the results of his investigations. The larger items of this program are the removal of such teeth and roots as cannot be saved for service, or whose retention, however serviceable otherwise, would be a menace to the welfare of the patient; the correction of traumatic occlusion wherever found: operative measures for the cure of pyorrhea; the removal of all encroachments of every description upon the soft tissues; care, by the most approved methods, of all root-canals in non-vital teeth, as well as in those in which morbid conditions necessitate devitalization, and of all periapical spaces where morbid conditions are shown to exist, and performing such filling operations as are necessary.

The nearest possible approach to physiological conditions being thus established in the field of operation and its environment, the surgeon's next and final duty, so far as it relates to his operative effort, will be the preparation of the teeth or roots or both, as the case may require, as piers or abutments for the restoration, after the character of the attachments has been decided upon and the form of preparation determined.

THE DENTIST AS AN ENGINEER.

This brings us to the consideration of the function and the duties of the engineer. The dental engineer serves largely in a consulting and advisory capacity, and upon the accuracy of his observations and the soundness of his judgment and advice rests the responsibility in great measure for the stability, the strength, the mechanical efficiency and the durability of the prospective structure. These qualities must depend largely upon the character of the foundation and the relation to it of the load and the leverage or stresses of the transverse motions to which the superstructure is subjected in mastication. An adequate and proper physical foundation is as essential to the durability of a dental bridge as it is to that of the Brooklyn Bridge or the Singer Building, but there is this essential difference—in the case of the larger structures the engineer calculates weight, stress, and other forces to which the structure will be subjected, and builds his foundation to meet the demands, while in the case of the dental restoration the patient presents with the foundation, whether good, bad, or indifferent, already in position.

It is the function of the dental engineer to study this foundation in all of its physical aspects and relations, to discover its points of weakness and of strength, its merits and demerits, any peculiarities it may possess, and to thoroughly acquaint himself with all of its physical details that he may plan the superstructure intelligently. First he should ascertain the character and characteristics of the teeth individually, whether single or multi-rooted, vital or pulpless, the quality of the tooth tissue, size, length, whether of normal conformation, and if not, the character and extent of the abnormality, and whether due to malformation, congenital defect, attrition, fracture, or mutilation. He should observe if there be caries, and if so, in what part or parts of the tooth and to what extent. He should note the presence of inlays and fillings, the materials of which they are made, and their state of preservation: metal bands or artificial crowns, either shell or post variety, and whether single or serving as bridge attachments. Then he should study each tooth in its relations to the retentive and surrounding tissues, *i.e.* its location in the jaw, the relation of its mesio-distal axis to the line of the arch, and the extent of any rotation from the normal; its position, and if malposed, the extent and direction of its deviation: the depth of its attachment in the retentive tissues, and if less than normal, the extent of the deficiency and whether due to elongation, recession, absorption, or a combination of these conditions; also its length beyond the retentive tissues and the relative proportion of this to the submerged portion; its stability, and if not normally secure, the extent and direction of the movement of which it is capable, and whether due to insufficient depth of attachment, root absorption or amputation, or absorption of the socket walls as a result of trauma or pathologic conditions.

Then, in the light of all these individual findings, the dental engineer should consider the relations of the prospective pier teeth to each other, especially the relative locations, relative stability, relative angles of position, which includes alignment, and the distance from pier to pier; also the number and locations of the spaces to be supplied, their relative lengths or widths, and the relations of the pier teeth individually and collectively to these spaces. Following this he must make the same general physical tests and observations of the adjacent and neighboring teeth individually and in their relations each to the other and to its retentive and surrounding tissues, and note in a similar manner the relations of the pier teeth to them.

Having thus acquainted himself with all the details of the physical conditions and relations of the teeth and tissues in the immediate field of operation and its adjacent parts, the engineer should now turn his attention to matters pertaining to the occlusion, and give them the same careful consideration. He should learn the character of the occluding apparatus, whether it be natural or artificial, and if artificial whether a plate or bridge; if natural, whether it be in normal occlusion with the teeth and space or spaces in the field of operation; if abnormal, the character and extent of the deviation from normal should be noted. He must observe the length of the bite, the depth of the attachment and the character of the anchorage of the occluding teeth, and test their stability. He must consider the location in the mouth of the prospective restoration and the character of the service to be expected of it. He must observe the general mouth conditions, the general character of the occlusion, and any deficiencies or peculiarities pertaining to it both with the jaws at rest and in action. He should observe the muscular action of the jaws in mastication as to strength and direction, and acquire a general knowledge of the patient's age, physical condition, food habits, and habits with reference to the uses and abuses of the dental apparatus.

With this data as the basis of his calculations the dental engineer must first determine the character of his restoration, whether it is to be the span or cantilever type of bridge, or both in combination, and select the teeth or roots to be used with a view to providing the most adequate practicable foundation for his superstructure. Selection here has no reference to the possible exclusion of the teeth adjacent to open spaces, but to the possible inclusion of additional teeth or roots if they be available. He should then determine the best method of handling each tooth or root and devise the type of attachment best suited to securing sufficient hold upon it while affording it adequate protection from accident or deterioration. Then, considering his sources of strength and its extent and the points of weakness in his foundation, the length of the pier teeth, the length and height of the prospective span or cantilever, the character of the occlusion, and any other pertinent data, and the relations of these details one to another, the engineer must make his calculations, and so plan his superstructure in all of its details and relations that in the finished product the arrangement of the occlusion shall be such that leverage or stress and stability of anchorage or resistance will be balanced as nearly as possible at every point, to the end that the greater burden shall be placed upon the stronger teeth and the weaker ones spared and aided proportionately.

RATIONAL OCCLUSION VS. NORMAL OCCLUSION.

The essential feature in the maintenance of any organ or tissue in the highest state of health and resistance and consequently of service is the performance of function, but we must differentiate between activity and function on the one hand and between function and strain on the other. So-called normal occlusion, like perfect mouth sanitation, is a beautiful ideal which we must keep always before us as our standard of perfection, but it must be remembered that normal occlusion is but a part of a larger scheme in which normal conformation, normal arrangement, normal apposition, and normal stability and resistance to stress must all play their parts, and that these conditions are necessary to a successful restoration of occlusion—indeed, I may say, for its tolerance. Where these conditions are not fulfilled I do not believe normal occlusion can be established and maintained. Occlusal contact of such character and force as to produce a degree of stress which would constitute mere performance of function for a tooth of normal stability and resistance will produce strain in the case of one less stable and resistant. Thus that which constitutes normal occlusion in the one case may be traumatic occlusion in the other; while what would be considered an insufficient occlusal contact and impact in the first case would in the second case be rational, though not normal.

In the light of these facts, then, I feel justified in concluding that while normal occlusion is a fixed and absolute relation between the occluding teeth regardless of the circumstances and relations of stress and resistance in the parts, rational occlusion is a condition in which the extent or area and character of the surfaces, their occlusal relations, and the force and direction of the impact are not necessarily those absolute conditions and relations implied by normal occlusion, but rather an adjustment of all these conditions and relations to the degree of resistance afforded by the stability of anchorage of the pier teeth; in other words, a scheme in which the stability and security of the pier teeth is the fixed point and the basis of calculation and operation. This is what I have chosen to call rational occlusion *vs.* normal occlusion. If it be heresy, I am a heretic. "Bear ye one another's burdens" is the great spiritual principle through the exercise of which those less fit are brought into serviceable relations with their fellows, and the standard of efficiency of society as a whole is thus placed upon a higher plane. It is no less applicable to the dental family than it is to society at large.

I dwell on these things because many years of experience have taught me that durability is measured largely by the degree in which stress is balanced or overbalanced by resistance, and that where normal resistance is not available, stress and consequently the conditions and relations which regulate stress, must be modified to meet the demands of this lessened resistance. I repeat, then, that it is the business and the duty of the dental engineer to determine and coordinate resistance and stress at every point, avoiding inactivity on the one hand and strain on the other, and thus as far as possible to foster function, and so increase the usefulness as well as lengthen the life of the restoration.

THE DENTAL ARTIST.

We come now to the artist and a consideration of his duties and responsibilities. The artist's concern is entirely with esthetic values, and your estimate of the importance of this function will be your appraisal of the value of his services, as he is largely responsible for the ultimate results from that point of view.

It is probably true that no feature makes or mars one's facial appearance to a greater extent than do the teeth. It must indeed be an unattractive countenance that will not in large measure be redeemed by the exhibition of a well arranged, well preserved, and well cared-for set of teeth of proper sizes, graceful shapes, and attractive shades, while an otherwise most beautiful face cannot overcome the handicap of a disorderly, deteriorated, and neglected denture. The relative importance of the artist in our scheme increases as the scene of our efforts moves from the posterior part of the mouth toward the anterior and from the lingual surfaces outwardly to the buccal and labial surfaces. The dental artist's function is to conserve unimpaired, as far as circumstances will permit, the esthetic integrity of the field of operation and its environment, and to enhance it to the greatest practicable degree at every possible point, and by all legitimate means. His duties are both operative and consulting. He should observe the teeth individually, first with reference to color, noting the degree of any departure from the normal, whether the tooth is affected in part or in its entirety, and the cause, whether the discoloration is due to pigmentation, chemical action, deterioration following loss of vitality, to the presence of caries or filling material within the tooth, or to accretions externally. He should note all fillings, their number, location, material, character, quality, and state of preservation. He should note the presence of caries, erosion, congenital defects, fracture, abrasion, mutilation, the proportion of the visible part of the tooth crown affected, and the extent of the disfigurement produced by any or all of these blemishes. He should also note any malformation of the teeth, any peculiarity of shapes, any variation in size or length either above or below the normal; the presence of bands or artificial crowns, either gold or porcelain, and whether they are single or serving as bridge attachments, as well as any other disfigurement, congenital or acquired, that detracts from the esthetic value of the teeth *per se*.

He should then observe each tooth in its relation to its fellows and its surroundings; its position in the arch relative to the normal, its angle of position labio- or bucco-lingually and mesio-distally, the relation of its mesio-distal axis to the line of the arch and the extent of any rotation from the normal; its comparative length, the extent of any abnormal protrusion through the tissues, whether due to elongation or tissue recession, and the extent of any separation that may exist; its approximal relations, whether in normal apposition to its fellows; any overlapping or underlapping; the character of the alignment and the general arrangement and the extent and direction of any deviation from normal; the occlusion and the extent and character of any deviation from normal. He must note the length or width and depth or height of the spaces to be supplied, the extent of the absorption of the tissues, and the conformation of the gums over which the restoration is to be made. He must observe the general and peculiar characteristics and appearance of the remaining teeth, especially those on the opposite side corresponding to the field of operation; the dimensions of the orifice, the length and conformation of the lips, the degree of protrusion or retraction of either or both jaws, the general facial contour and expression, and all the relations between the lips and the teeth and the gums as they appear during repose, conversation, smile, and laughter. He must note any inherent or relative disfigurement or anything that is conducive to a lack of harmony in the mouth or with the surrounding features and the general facial expression. He must make a general observation of the patient with reference to sex, age, education, refinement, station in life, social position, personal appearance, physical condition, care of the person, care of the teeth both as to cleanliness and to judicious uses, and the mental attitude toward the esthetic in general, and toward the esthetic value of the teeth in particular.

When the character of the restoration has been determined upon he must be in consultation throughout the progress of the work with the surgeon, the engineer, and the artificer, directing here and pleading there, finding his greatest usefulness perhaps in his rôle of the suppliant rather than in that of the dictator. His constructive effort must be directed largely toward the correction by removal, alteration, adjustment, substitution, addition or otherwise, in the greatest practical measure, of the blemishes and disfigurements inherent or relative, in or pertaining to the field of operation; toward the selection of artificial substitutes to replace the lost natural organs and toward their preparation and arrangement; the harmonizing of shades; the imitation of the natural organs as to size, conformation, and arrangement, avoiding disfiguring effects and defects, and copying or producing such of both as lend individuality or otherwise aid in the simulation.

It is said of a famous artist that he had placed over the door of his studio this legend, "The perfection of art is to conceal art." Surely nowhere else could such a sentiment be more fittingly harbored than in the consciousness of the dental artist, where it might serve as the basis for his ideals, the goal of his accomplishments, and a perpetual incentive to his greatest mental and physical endeavors. Perhaps my own vanity and pride of achievement have not been more completely gratified than on the rare occasions when, having finished a crowning operation and given my patient the opportunity of observing it in the mirror, she has said, "Well, Doctor, which tooth is it?" Art and beauty as they apply to the dental equipment need not necessarily be synonymous terms. The inherently beautiful may be entirely out of harmony with its surroundings, and thus be highly inartistic. The true artist will neither cast his dental pearls before swine nor place gold crowns on central incisors in the mouths of Venus and Adonis. Between these extremes there is ample opportunity for the exercise of genius, or of such talent as one may possess, with its aim fixed always upon the one ideal expressed in the legend, "The perfection of art is to conceal art."

THE DENTAL ARTIFICER.

We come now to the last of our quartet, the artificer, the servant in the house. His is a more prosaic calling. His efforts lack much of the dramatic quality of the surgeon's, the romance of the engineer's, and the poetry of the artist's, but the value of his services is not to be underestimated. Upon him falls the responsibility for the mechanical excellence of the undertaking and the accuracy of its fit and adjustments, and so, in large measure, for the conservation of the results of the efforts of his superiors. As "Man proposes and God disposes," so his overlords may propose and the artificer dispose. "The best laid schemes o' mice an' men gang aft agley." So it is likely to be with the surgeon, the engineer, and the artist, if the artificer be inefficient or unfaithful in the performance of his duties. The artificer's voice is not heard in the councils of the consultants. His duties are purely operative. It is his function to put into execution the plans and specifications of his superiors, to carry out the actual work of construction. He must possess a knowledge of the nature, the uses, and the working properties of gold and platinum and other of the noble and base metals and their alloys, of plaster, wax, and their compounds, of porcelain, and of many other materials, as well as the requisite skill and ability for their manipulation.

Thus we have outlined for each of our *dramatis personæ* his individual part in the economy of our constructive effort. Each, except the artificer, seeks by diagnosis much the same information in many details, but each from his own viewpoint and to serve his own ends.

We have seen that conservation of normal and useful tissue and the establishment of a physiological status are the ideals of the surgeon; stability of the foundation, security of attachment, mechanical efficiency, and durability, those of the engineer; and the establishment and maintenance of the highest possible degree of cosmetic and esthetic harmony and excellence, those of the artist. But none can be independent of his *confrères.* Though their ultimate aims are all for the good of the patient, their individual interests often conflict, and as the proportion of cases is probably small in which the best interests of each may be completely or equally served, there must, in most cases, be compromises for the general good.

The question arises as to who or what shall determine the nature and extent of these compromises, and it must be answered that there can be no set rule as to the relative importance of the claims of these often conflicting and contending ideals. Each case is a law unto itself, and must be studied in consultation on its merits. All the data gathered in the diagnosis must be considered, among the more important items being sex, age, health, habits, environment, location of the prospective restoration, general mouth conditions, appearance of the teeth, facial expression, etc. There are conditions under which the desires of the surgeon must predominate, where the demands of conservation will outweigh the apparent advantage to the engineer of sacrifice for the sake of additional security, or to the artist of substitution for esthetic improvement. There are others in which the wishes of the engineer must prevail, where, for the necessary security of attachment, sacrifice of tissue must be made beyond the desires of the surgeon and the artist; and still others in which esthetic considerations take precedence, and where the artist demands the sacrifice of disfiguring tissue and the substitution of artificial material against the surgeon's preference for conservation on the one hand, or the retention of sound and harmonious material which the engineer would sacrifice for greater anchorage facilities, on the other.

Thus we have always these three contending ideals, conservation, security, and esthetic harmony, and only a careful study of each case as it presents will determine their relative importance in that particular case. There are two considerations, however, which must always be given weight in reaching this determination. The first is, that while the surgeon's efforts in placing the field of operation in physiological condition may be looked on as constructive, the true surgeon, who is the special guardian of the systemic welfare, looks upon all preparation for restorations as destructive, and sacrifices vital tissue always grudgingly, except where the general systemic needs and requirments demand it. Such tissue sacrifices as are asked, therefore, should always be in the interest of superior advantages. The second consideration is that in every case the engineer must insist upon such alteration of the teeth by tissue removal as will afford him sufficient security of anchorage for his prospective attachments. But there is a limit to such needed security and consequently to the necessity for tissue sacrifice, and it should be the concern and the pride of the engineer to devise attachments based upon the very important principle of tissue conservation.

BASIC FAULTS FOUND IN CROWN AND BRIDGE WORK.

I am convinced that much of our restoration, as I have observed it, is criminally defective and inefficient from the surgical standpoint, entailing as it does a wanton destruction of the hard tissues of the tooth and the pulp as well, far outweighing any advantage it has to offer, while, so far from being prophylactic in its relations to the retentive tissues, it is positively destructive to them, vitiating the virtues of restoration with the vices of vandalism and pollution. Much of it, also, has two serious faults from the engineering standpoint: First, too few teeth are included as piers or abutments in the foundation, leaving it inadequate for the service required of it; second, such teeth as are used are mutilated beyond reason in obtaining a security of attachment to the foundation that is out of all proportion to the needs of the case. One does not need an anchor-chain to hold one's watch. Likewise much of it is a complete failure from the artistic point of view by reason of its substitution of the glaring and repulsive gold tooth, generally malformed and frequently malposed, for the graceful and exquisite enamel surfaces—the pearls of great price—which nature has been at such pains to produce, and has harmonized in such a wonderful way. The gold band, the open-face crown, and such other conspicuous and mutilating devices are scarcely less reprehensible.

And, alas, even the workmanship, so called, proves in many instances to be but the bungling efforts of the botch. But it is not enough that we be merely good jewelers and our productions conformed even to the highest standards of that art or trade. A bridge-work restoration in its highest development is not a mechanical operation, and the man who performs it on that basis has failed to catch the vision and to comprehend its true mission. To be sure, the details of its execution are mechanical, just as no surgeon ever took a scalpel and opened into the abdominal cavity that he did not do a mechanical thing. But it is the subject of our operations and the object for which we perform them that lift them out of the sphere of butchery and mechanics into the realm of surgery and art. To serve its highest mission every bridge-work operation should combine good surgery, good engineering, good artistry, and good workmanship, and any operation which falls short in any of these particulars fails in the degree in which it is thus deficient.

A prominent bridge worker, in a recent essay on "Removable Bridge Work on Non-Vital Abutments," says: "Let us assume for the sake of argument that no septic conditions will ever occur at the apex of a devitalized tooth, and that a dead tooth is just as good as a live one." Could any assumption be more ridiculous and its public expression more vicious?—coming at a time, too, when many of the ills in every part of the human body with which men are suffering and dying are being attributed directly to mouth conditions, and especially to the regions surrounding the apices of the roots of non-vital teeth, and when the entire dental and medical professions are keyed to the highest pitch in their efforts to relieve and prevent these pestilent and devastating pathological processes!

The surgical principles involved in the work of the destructionists who tear out the pulps in all teeth included in bridge operations to prevent, as they say, the development of morbid conditions within those pulps, seem to me to be on a par with those of the surgeon who would amputate all legs below the knee-joint to prevent his patients from developing bunions on their feet, or with the extraction of teeth in early life as a preventive against caries or pyorrhea. The "rubber nerve" belongs in the same category with the wooden leg and the glass eye. None of them can ever be anything more or less than a necessary evil.

The excision of sound teeth, the destruction of their pulps, and the reaming out of their root-canals for the placement of the split pin, and their alteration for many other devices of the removable-bridge operators is a crime against both surgery and engineering, as atrocious from both standpoints as is the anterior gold crown from the esthetic point of view, and the most beautiful workmanship ever accomplished can never redeem it nor atone for it.

Still another essayist, a teacher, announced as the subject of his essay, "The Absence of Standards in Crown Work," and consumed a considerable part of his time in an effort to prove anatomically, by diagrams and otherwise, the necessity for removing the entire covering of enamel from the teeth for the purpose of fitting shell crowns to them. The shell crown and the necessary preparation for it do not need to be standardized—they need to be abolished; and bridge work itself needs to be individualized. There has been too much standardizing already, but to low and pernicious standards. Much of it reminds one of the low comedy antics of some burlesque comedian attempting to play Hamlet. To view it in the light of the standards we have tried to set up, one could well imagine that the surgeon had died, that the engineer was in the asylum, that the artist had been stricken blind, and that the artificer, much the worse for recent nocturnal experiences, had turned the whole matter over to the tender mercies of the office-boy!

As every business must have organization and system to be successful, so must every man have his own faculties organized and trained if he is to accomplish things worth while. It is not given to one man to know and to do everything well, but every man should train himself to know and to do every part of one thing well. I shall not presume that my elders and superiors need such stimulus as I can offer, but if my words shall spur this quadruple professionality, the surgeon, the engineer, the artist, and the artificer, within the being of some younger practitioner, to conceive intelligently, plan wisely, and execute thoroughly, they will have served their purpose.

149 Broadway.

Soldering and Its Application to Dentistry.

By WM. W. ATKINSON, Philadelphia, Pa.

THE operation of soldering is not original with dentistry, but is an application, with a better knowledge of certain underlying scientific principles, of an important branch of the jeweler's craft, and it is to this craft that is owed much of the technique of the work as well as many of the formulas of the solders themselves. Examples are many of objects of art, use, and adornment which were assembled by means of soldering, and which bear witness to the skill of a craft whose history extends back to civilizations now extinct.

Specifically, soldering means "to consolidate, to join," and it may therefore be broadly described as the joining of the parts of objects of metal or alloys of metals by means of (*a*) another metal or alloy of metals, these having lower melting-points than the objects to be joined and which are termed solders; or of (*b*) "sweating," that is, the melting together of the surfaces in contact; or of (*c*) "welding," *i.e.* the joining of objects of certain pure metals, either by bringing them to a temperature somewhat below their melting-point and then uniting them by mechanical force, as under the blows of a hammer, or, in the cold state, uniting them by mechanical force alone. Excepting where, as, for instance, in welding, pure metals are to be used, soldering is an operation of surface alloying, whereby the parts are joined by fusing the solder into them, using a protective or deoxidizing flux in order that the parts shall be clean and the solder shall flow freely over them. During this operation the solder and the metal beneath it, in accordance with the law of diffusion, are by osmotic pressure mutually dissolved, forming at the joint a new alloy, the concentration of which is determined by the factors of temperature, time, and composition. From this it will be seen that if the work is subjected to excessive heat for too long a time, too great a penetration of the solder results, and the work may thereby be weakened. On the other hand, if the heat is insufficient, and the time of exposure too brief, an imperfect union results.

It is of interest to note that the foregoing view of the principle of soldering as an operation of surface alloying was first presented to dentistry and perhaps also to metallurgy in a scientific treatise on Soldering, by Dr. E. C. Kirk, on page 803, vol. iii, of Dr. Wilbur F. Litch's "American System of Dentistry." The following extracts are given, which illustrate the principle:

> Soldering is the process of uniting two metallic surfaces, either by direct fusion of the contiguous portions or by the intervention of a more fusible metal or alloy, and while not, generally speaking, a metallurgical process, is so closely related, and the principles which it involves are to so great an extent those which govern the formation of alloys, that it may be properly considered under the latter head. . . . In all cases where two metallic surfaces are caused to unite by

> interposing a metal or alloy more fusible than the metals to be united, the process is simply one of superficial alloying. . . . The union of two surfaces of platinum by means of fine gold furnishes one of the best illustrations of the soldering process. . . . When two platinum surfaces are united by flowing pure gold between them . . . . a portion of the gold unites with each plate or surface, alloying with it to a certain extent, while a film of pure gold completes their continuity. If the heat is sufficiently intense and prolonged, the gold film grows richer in platinum, becomes more infusible, and the platinum surfaces are more intimately united by the gold and platinum alloy.

In the various solders several of the main divisions of alloys are utilized, such as the chemical compounds, solid solutions, and eutectics, either complete or as modifying intermetallic constituents. Upon these depend such physical properties as smoothness of flow, richness of color, melting-point, resistance to corrosion, tensile and compressive strength, hardness, and electrical conductivity, so that in the formulation and use of solders their internal constitution bears a most important relationship. There are several types of soldering, such as soft soldering, sweating, welding, and hard soldering. These we shall consider in the order given, with notes of interest upon their industrial uses and more extensive reference to their application to dentistry.

SOFT SOLDERING.

The solders used in soft soldering comprise principally various combinations of the metals in the Sn-Bi-Cd-Pb system, which form binary, ternary, and quaternary alloys. According to Desch* there are no chemical compounds between these metals, but there are four ternary eutectics, six binary eutectics, one quaternary eutectic, and a number of solid solutions. The eutectic is that concentration, in an alloyed series of metals, the melting-point of which is lower than that of any other concentration in the series. In the cold state the eutectic alloy is a physical mixture of its component metals, known as two or more coexistent phases in the solidus. When complete and properly prepared it is homogeneous, and therefore well adapted to operations of soft soldering, for though freely modified to meet given requirements, such modification is consistent, as it is accomplished by varying the percentages of the metals in the series, the effect of which is to influence, but not adversely, the hardness, melting-point and flow. Thus in the binary system Pb-Sn there is a eutectic occurring at 75 atomic per cent. Sn, corresponding to the formula Sn_3Pb, m.-pt. 180° C., which is the basis of plumbers' and tinners' solders, and which is modified to adapt it to its several uses by varying the percentages of its metals. Were other metals, having chemical affinities for Pb or Sn, to be introduced into the alloy, they would add several disturbing critical points to the solid and liquid phases, and so cause the solder to flow unevenly and also cause segregation, thus complicating the work. It is interesting in this connection to note a modification of Sn_3Pb by the addition of Pb to a concentration lying between 60 and 67 per cent. which forms a plastic, nonfluent solder for use in "wiping" joints, a method employed in the plumbing industry for joining the ends of lead pipes, in which the solder, in a mushy state, is "wiped" into position by means of a cloth pad over the parts to be joined. The "wiping" solder is used at a temperature between the melting-point of the eutectic, 180°C., and that of Pb, 327°C., thus all of the lead in excess of the eutectic proportion remains in a finely divided, unmelted state, affording a network of small, solid crystals of free Pb, which sustain the melted eutectic.

There is a eutectic of Bi-Pb, m.-pt. 125°C., occurring at 56.5 atomic per cent. Bi. There is also a ternary eutectic of Bi-Pb-Sn, which in several modifications affords the very low fusing industrial soft solders, and is met with in dentistry as fusible die metal, used for casting dies and counterdies for forming crowns, cusps, clasps, and other small swaged work and also for finishing models for metal plates, upon which the final swaging is performed in a "shot swager." Bi-Sn forms a eutectic, m.-pt. 137° C., at 43 atomic per cent. Bi. It is the base of low-fusing alloys such as Weston's "metal," Watt's "metal," etc., used in dentistry for casting inlays, crown bases, and lower dentures, and as a solder for assembling certain types of orthodontia appliances, as for instance the Jackson wire devices. Cd is sometimes used in industrial solders of both the soft and hard varieties, but is contraindicated for dental alloys because of its tendency to corrode by electrolytic action in the human mouth.

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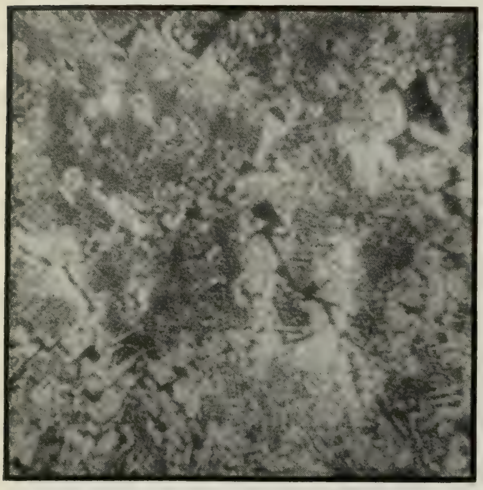
* Cecil H. Desch, "Metallography," 1913.

FIG. 1.



Eutectic Bi-Sn, atomic formula $Bi_{43}Sn_{57}$; m.-pt. 137° C. (C. A. Kapp, *vide* Desch's Metallography, p. 400). Cast against polished glass and etched with 1:10 HCl. Magn. 275. *Dark ground,* crystals of Bi, containing a small portion of Sn in solid solution; *light ground,* matrix of Sn containing a small portion of Bi in solid solution. This eutectic is the basis of low-fusing dental alloys such as Watt's, Weston's, and Melotte's metals," but has long been used in industrial practice; for instance, fusible alloys having Bi-Sn as their bases were noted by Prof. Benjamin Silliman, Jr., in his "First Principles of Chemistry," 44th ed., 1858, under "Chemical Relations of Metals," p. 283, para. 473, as follows: "The metals unite with each other to form *alloys,* many of which are familiarly known. . . . The fusibility of alloys is often greater than that of the constituent metals. Newton's fusible metal, an alloy of 5 parts lead, 3 tin, and 8 bismuth, is an example. Lead fuses at 617° F., bismuth at 509° F., and tin at 442° F., while Newton's alloy fuses at 203° F."

The eutectic alloys of Bi with Sn or Pb expand at the instant of cooling—a valuable property in dental technical practice. Thus when a Bi-Sn alloy is cast into an inlay, the metallic alloy by expanding fills all the inequalities of the mold and also offsets the shrinkage of the mold that has occurred as the result of the drying-out process. If there is enough Bi in the alloy it casts sharp and clear and is comparatively strong, so that Bi-Sn affords satisfactory as well as inexpensive substitutes for gold for inlays and other restorations where the stress will not be too great. The alloys of Bi-Sn are not poisonous. In their melting, care must be taken that they are not overheated and that they are protected from oxidation. The proper protective flux is zinc chlorid solution. Surfaces that are to be joined in orthodontia work should first be "tinned" with the solder before they are assembled, which simplifies the subsequent work of attaching larger bodies of solder. A tinner's iron of convenient size is the correct implement for carrying and applying the melted soft solder. This "iron" is a pyramid-shaped bar of copper, its base fixed upon an iron or steel rod the other end of which is set in a wooden handle. Where an exceptionally large body of solder is needed, as in forming saddles in orthodontia appliances, the solder may be built up by shaking it from the hot iron upon the previously tinned and fluxed surfaces, then upon the solder that has set but is not yet cold. By repeating this operation the solder can be built up to the needed dimensions, after which it is to be smoothed into shape. In the repairing of a broken fusible metal plate it is often possible to use the soldering process in the manner outlined above, instead of investing the plate and casting a new part, and if the plate carries a vulcanite attachment, the repairing of the vulcanite can be carried out in the usual manner after the fusible metal base has been joined.

It should be noted that fusible alloys such as Weston's should not be cast into overheated molds, as the consequent slow rate of cooling makes for segregation and large crystals, which mean weakness.

SWEATING.

Sweating or autogenous soldering is a means of fusing together contiguous parts of objects of metal without the intervention of solder. It is used, for instance, to join the ends of wires in certain scientific apparatus where the use of an alloyed solder would introduce disturbing galvanic factors and so interfere with the accuracy of the results. It is also met with in industrial practice in the repairing of platinum tubes and vessels used by chemists, also in joining the linings of lead or platinum condensing chambers in the chemical manufacturing industry. Were such work to be performed with alloyed solders, galvanic couples would be established and the positive member of the pair would be decomposed by electro-chemical action.

In the jewelry trade sweating is employed for inclosing heavy plates of base metal within lighter plates of gold with which to make inexpensive "rolled plate" jewelry. The surfaces of the metals are forced into contact, fluxed with powdered leadless glass and "sweated" together in an annealing furnace, at a temperature somewhat short of the melting-points of the metals involved. When the critical temperature is attained there is a shimmering appearance to the metals and the flux is seen to ooze out from the joints, after which the plates are quickly withdrawn, cooled and rolled down to the desired gages. The form of each plate of metal has been preserved and only a thin film of those surfaces that are in contact has been fused. This is paralleled in dental metallurgical practice in the joining of plates of pure gold to plates of platinum for use in making crowns and also backings for porcelain teeth. Here fluxes are not needed, for neither metal oxidizes. Their surfaces are made chemically clean in an acid bath, washed, dried and then pressed into close contact and placed, platinum side down, on the floor of an annealing furnace. A high heat is applied and this ascends through the platinum to the gold, so sweating the two metals evenly together. Between the plates of gold and platinum there is formed a homogeneous solid solution, an alloy of the two metals, much harder and more elastic than either of its constituents. By reason of this, the resultant "crown metal" is stronger than either gold or platinum, hence may be safely used in thinner gages than ordinary gold plate. Another important advantage of this "metal" is that the platinum surface may be used on the visible side of a replacement, so making it less conspicuous.

Another interesting example of the union of platinum and gold, although it is an operation of soldering, is so closely allied to "sweating" that it is thought well to include it here, namely, that of assembling the platinum bases of porcelain crowns and the platinum parts of continuous-gum dentures. Pure gold is the solder employed, and it must be kept melted until it forms with the platinum a true alloy, characterized by the entire loss of the orange-yellow color of the gold and the establishment of the dark gray color of the platinum-gold solid solution, the melting-point of the latter being higher than the melting-point of gold. If this alloy were not complete, *i.e.* if free gold were present, there would be vaporization of the gold during the subsequent operations of fusing the porcelain layers, and porosity and discoloration would result. There is a platinum solder with the composition Pt 75% + Au 25%, but gold foil, correctly manipulated, is more convenient to use.

The assembling of 22-k. and coin gold (21.6-k.) crowns by sweating presents several marked advantages over ordinary soldering. Crowns whose side seams are joined and whose cusps are attached by sweating are stronger than when solder is used for that purpose. They are the same color over the outer surfaces and there is no danger of the seams opening in the subsequent work of reinforcing the cusps or in making the attachments to dummies in bridge work. Practice is needed to acquire the technique of sweating a crown, which is as follows: Against a strip of gold of desired height is placed the flattened-wire crown measurement. One end of the wire is flush with one end of the gold plate. A mark is made on the plate with a sharp steel point at the other end of the wire. The gold plate should be cut at a point about one and one-half times the dimension of the gage of the plate beyond the mark. The ends of the piece of gold plate which was cut out are now beveled by filing on the opposite ends so that when the collar is formed, the seam shall be a lapped bevel. This is best because it is stronger than an abutted seam which has squared edges and it presents no projecting surfaces as does a seam whose squared edges overlap each other. The gold pattern is formed into the shape of a hollow cylinder and its circumference is now the exact length of the wire. The beveled edges are brought into close contact by passing them alternately over and under each other until the "spring" of the metal is overcome and they are in exact juxtaposition. The collar is now placed, without wiring and with the seam uppermost, on a charcoal block. The seam is sprinkled with powdered borax glass and the small brush flame of the blowpipe is played through the collar, first heating the side opposite to the seam. This expands the metal toward the seam and so closes it, whereas the seam would be opened if the heat were applied to it first. The heat is now applied evenly to the whole collar and when the borax is seen to fuse, a small pointed flame is played from one end of the seam to the other. At the critical moment the gold will be seen to fuse slightly at the edge of the seam and then to flow smoothly and swiftly through it, whereupon the flame is instantly withdrawn.

It is well for one not familiar with this work to cut the crown collar to a greater height than is needed so that if the ends of the seam happen to burn down, the collar can be trimmed to shape and it will not be necessary to make a new one. To sweat a cusp to the collar, the upper end of the collar should be filed to a bevel. After fluxing, the swaged cusp is placed over this bevel. A narrow flange, having been provided for during the trimming and adaptation of the cusp, should project slightly beyond the collar. The parts are held together by a sling of iron binding-wire, the ends of which are twisted tightly together. The crown, cusp downward, is held by the twisted portion of the wire with flat-nose pliers and the flame of the blowpipe is played evenly over the whole crown until the metal becomes bright red, then a small pointed flame is played against the flange of the cusp, one point at a time, until the flange sweats down around the collar and successively fills in each point of the seam except those points which lie beneath the binding wire. Before these latter points are sweated the wire should be removed, and the work is completed on a charcoal block. Otherwise the iron of the wire would melt into the gold and alloy with it. Should this mishap occur and the wire is not too deeply embedded in the gold, the wire can be dissolved out by boiling in slightly diluted hydrochloric acid.

WELDING.

Welding is a means of joining two surfaces of a pure metal. It is distinct from ordinary soldering or sweating, in that the molecules of the metal are not brought together in the free state by melting, but are driven together, either by pressure alone in the cold state or by pressure and heat combined, in which case the heat falls short of the melting-point of the metal. Notable instances of those metals which can be welded are gold, iron, and platinum. Alloys or metals containing impurities cannot be welded satisfactorily. True welding is distinct from electric welding, for in the latter method the union of the surfaces is effected solely by fusion in an electric arc. "Cold" welding is met with in dentistry in the building up of gold fillings. The leaves of pure gold foil or the crystals of sponge gold are welded together under a serrated plugger by malleting or pressure. Another example of welding in dental metallurgical practice is the treatment of platinum sponge, which is finely divided metallic platinum that has been precipitated from its chlorid. It is first strongly compressed in the cold state, then heated to incandescence and the crystals welded by the blows of a hammer. True cohesion results and the mass may be rolled down or drawn into wire. With the advent of the oxyhydrogen blowpipe this method was largely abandoned, and it is mentioned here simply as a matter of historical interest.

HARD SOLDERING.

Hard soldering has extensive industrial application and is the most important branch of soldering in dentistry. The distinction which its name implies rests upon the difference between the hardness and the melting-points of "soft" and "hard" solders. There is also a difference in the technique employed. There are several branches of hard soldering which though alike in their underlying principles, differ widely in the composition of the solders as well as in the technique necessary to their use. They may be classed as brazing, gold soldering, and silver soldering, and each demands special knowledge for its successful application. These in turn may be resolved into two types of soldering. In one of these there is a difference only in the relative proportions of the components of the solder and the object to be soldered, those ingredients which lower the melting-point being introduced in higher percentages. In the other type of hard soldering, metals such as zinc, cadmium, arsenic, bismuth, and tin are introduced into the solders in order to lower their melting-points. Cadmium vaporizes readily in alloying and soldering, and arsenic, bismuth, and tin, though they have marked influence in lowering the melting-point, all cause brittleness. So that of all the metals used for lowering the melting-point of hard solders, all but zinc have almost been abandoned for that purpose.

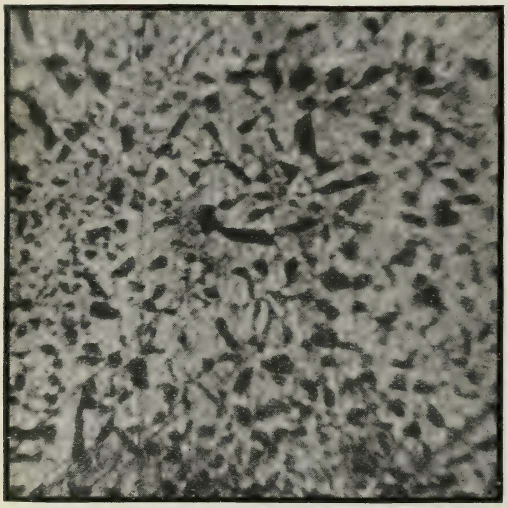
Thus the types of hard solders may be called "zincless" and "zinc" solders. The fluxes most used are borax, either powdered or in saturated solution, powdered leadless glass, potassium or sodium carbonates in solution, or a combination of the two in solution and also potassium cyanid in solution. These fluxes act to convert metallic oxids into fluent slags (glasses) which mechanically protect the surfaces to be soldered from the air and the gases it carries, and to interpose in the seam a film that acts as a lubricant for the flowing solder, moving from under the solder as the latter advances, and so "leading" it into place.

Powdered leadless glass is used only where a high-fusing solder is employed, as for instance in the brazing of iron and steel and in operations so extensive that borax or potash fluxes would be too fluent and would run off at the seams. In the use of powdered leadless glass a portion of its silica combines with the metallic oxids of the objects to be soldered and converts them into fusible silicates. Potassium or sodium carbonates and potassium cyanid are lower-fusing and are more readily dissolved away from the metal than is either powdered glass or borax. Powdered borax glass is preferable to borax, as it contains no water of crystallization, as does borax, and therefore fuses quietly and without great increase of volume.

BRAZING.

Brazing is the soldering of brass, iron, steel, and high-fusing bronzes. It is an obvious term, for the solder used is simply a brass which by reason of a high percentage of zinc has a lowered melting-point. Small operations such as soldering steel rods in automobile engines in repairing them and other small machine parts, can be conducted conveniently by means of the ordinary compound blowpipe, employing ordinary illuminating gas and air, but the larger operations require a more intense heat such as is afforded by the oxy-acetylene blowpipe. Brazing solder is seldom as strong as the object upon which it is used, so that it is often necessary to reinforce brazed work either by solder massed over and around the break or by properly placed reinforcing sleeves or plates. Where the work permits, as for example in the brazing of objects of brass, the strength of the solder is increased by quenching in cold water while the soldered joint is red-hot. With brazed steel, however, this method is not applicable, as quenching hardens steel to brittleness and the difference in the coefficients of the contraction between steel and brass would cause a state of strain at the joints. Brazing solders belong to the Cu-Zn system. Desch* says of this system: "Alloys containing 32 to 52 per cent. zinc are homogeneous at 800°C., forming the *b* solid solution. At lower temperatures those richer in copper throw out crystals of a second solution, while those rich in zinc throw out crystals of a compound Cu_2Zn_3. There is a conjectural compound, formed at 905°C. from *a* solid and liquid, having the formula Cu_2Zn(?). Other compounds may exist, but their formulæ are uncertain." The quoted authorities for these compounds are E. S. Shepherd and V. E. Tafel. In dentistry, brazing and brazing solders are interesting more from an academic than from a practical standpoint, as silver soldering is used for dental technical operations where in the industries brazing would be used.

Fig. 2.



Ag-Cu-Zn system. Dental silver solder, melted and cooled as it would be in dental use. Etched with 1:10 HNO_3, annealed and then cleared with 1:3 H_2SO_4. Magn. 375. There is no evidence here of the presence of the eutectic of silver-copper, those metals seeming to have been absorbed in the chemical crystals and solid solutions. *Dark ground,* crystals of brass (CuZn) containing silver in solid solution; *light ground,* matrix of crystals of silver-zinc containing silver and copper in solid solution. The structure is that of a homogeneous mixture of two alloys in each other.

ZINCLESS GOLD SOLDERS.

Zincless gold solders are modifications of the plate golds upon which they are used. They are necessarily of lower karat, and the alloy used in them is in different proportions, thus lowering their melting-points. Both the plate gold and solders are in the ternary system, Ag-Au-Cu. In this system there is the Ag-Cu series, where at opposite ends of the concentration curve—that is, the curve through which are plotted the percentages of each component of a series—there are solid solutions of copper in silver or of silver in copper, and at a point corresponding to the atomic formula Ag_3Cu_2 there is a homogeneous eutectic (Levol's alloy) with a melting-point of 778°C. There is also the Au-Ag series consisting of isomorphous crystals, and the Au-Cu series, the freezing-point of which latter passes through a minimum at 883°C. In the Au-Cu series the freezing-point, irrespective of concentration, lies entirely between the minimum 883°C. and the freezing-point of copper, 1084°C. From these facts it may be safely assumed that all the Au-Ag-Cu alloys are, when correctly prepared, homogeneous solid solutions of Ag-Cu in

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* Desch, "Metallography," 1913, p. 62.

Au. Many of their properties are determined by the larger percentages of Au that they contain, with their freezing-points and other properties markedly influenced by the eutectic and solid solutions in the Ag-Cu series, and the minimum in the Au-Cu series. As their proportion of alloy to gold increases, the melting-point occurs at a point below that of the mean of the constituents. Solders in this series have expansion coefficients closely approximating those of the plate golds in the same series, therefore in cooling they contract in the same ratios, so that the work is but little disturbed by the readjustment due to cooling. The solders closely match the gold upon which they are used, as the Ag-Cu may be introduced in such percentages as assure control of the color.

Industrially, zincless gold solders find their principal application in the jewelry manufacturing and repairing trades, being especially useful in such continuous operations as the joining of links of gold chains and mesh bags, where relatively great strength and toughness are required and where the soldering of successive links shall not cause the opening of those that have just preceded. In the dental use of zincless gold solders it is necessary in the case of work that is inclosed in sand and plaster or other investing material, that the whole investment be heated to almost the melting-point of the solder and that the separate parts of the piece shall have been either sweated or soldered with zincless solder before investing, also that the solder be applied in thin, small pieces so that the

FIG. 3.

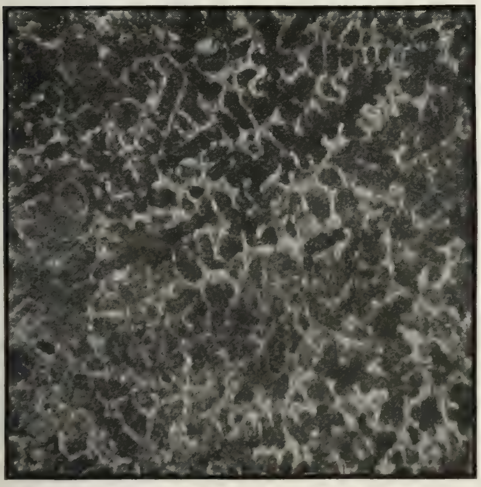

FIG. 4.

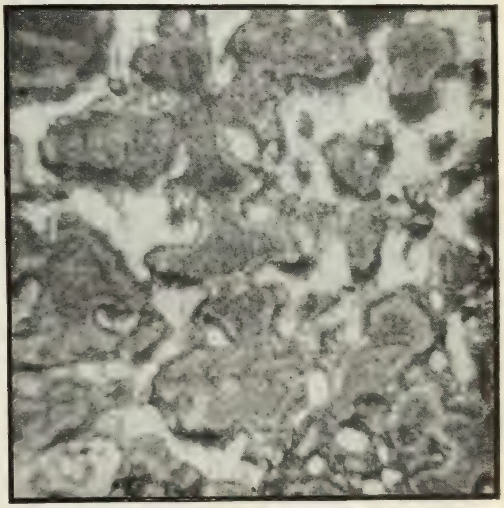

FIG. 3: Au-Ag-Cu system. Zincless gold solder, melted and cooled as it would be in dentistry. Etched with aqua regia, then annealed and cleared with 1:3 H_2SO_4. Magn. 100. The structure is that of a homogeneous solid solution of gold-silver-copper, with evidence of a slight intervening eutectic of silver-copper containing gold in very slight percentage. Crystals are irregular polygons, arranged in chains and curiously "twinned" (merged in the cooling so as to form compound crystals), these forms being incidental to the rate of cooling and to crystalline attraction. There is but little evidence of dissolved metallic oxid, an important advantage in this type of solder.

FIG. 4: Zincless gold solder (same as No. 3), in higher magnification. Magn. 250. Here the crystals are shown further resolved, the compound crystals clearly showing peninsula-like connecting links by which the smaller crystals are joined. The lighter portion of the field is the eutectic mentioned in describing Fig. 3.

flame of the blowpipe may act upon as large a surface at one time as is possible.

GOLD-ZINC SOLDERS.

Zinc as a constituent of gold solders makes for a heterogeneous material, as its chemical affinity for each of the other component metals results in the formation of several phases, according to the temperature that is attained in the melting, and also the subsequent rate of cooling. Thus in a solder of a given karat some parts are likely to be richer in zinc than others, with the result that slight overheating causes perforations in the gold plate upon which it is used, and when improperly prepared or remelted without proper protection against the atmosphere it has a sluggish, mushy consistence that makes it necessary to "tool" it into place with the pointed end of a slate or steel instrument, instead of its flowing smoothly and readily. Its compounds with the metals of the Au-Ag-Cu system are respectively AuZn, Au_3Zn_5, and a questioned formula $AuZn_8$ (R. Vogel), AgZn(?), Ag_2Zn_3, Ag_2Zn_5 (H.

FIG. 5.

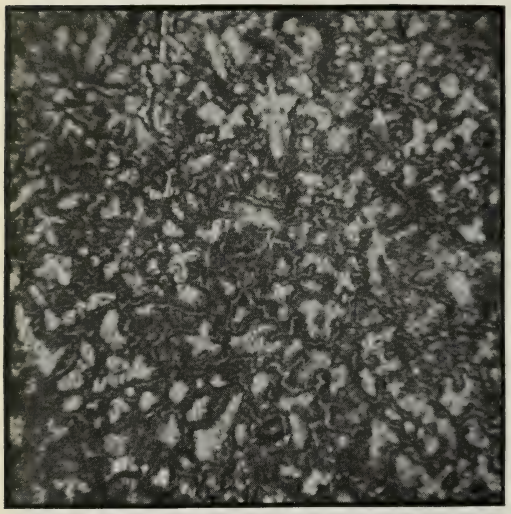

FIG. 6.

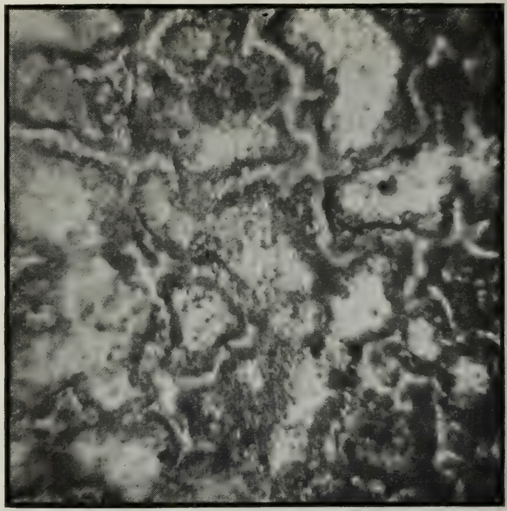

FIG. 5: Au-Ag-Cu-Zn system. Gold solder containing zinc, melted and cooled as it would be in dentistry. Etched with aqua regia, then annealed; cleared with 1:3 H_2SO_4. Magn. 30. This solder has the same basic alloy as in Fig. 3, but with the addition of zinc—the profound effect of which latter upon the structure is well illustrated in this photomicrograph. There are swirling pools of a gold-copper-zinc solution, containing a small portion of silver, and these pools serve as matrices in which are inclosed lighter colored crystals of silver-zinc containing gold-copper in solution. It is to be remarked that this system is heterogeneous, which accounts for the frequent "burning" of soldered work upon which it is employed. There is also evidence of dissolved oxids.

FIG. 6: Gold solder containing zinc. Magn. 250. (Higher magnification of Fig. 5.) Comparison of this with Fig. 4 shows the disturbing effects of zinc when added to gold solder, or to any ternary system of metals where the zinc has chemical affinity for each of the other metals in the system. Complicated reactions occur which destroy the sharp outlines of the crystals and make for differences of concentration in various portions of the field, and, where the zinc is oxidized, cause the solder to flow sluggishly. The marked contrast between this structure and that of silver solder (Fig. 2), wherein the reactions are of a more simple character—mere combinations, in fact, of the Ag-Zn and Cu-Zn systems—is a further illustration of this point.

C. H. Carpenter, W. Whitely), Au_2Zn (E. S. Shepherd), Cu_2Zn_3 (V. E. Tafel). Some of these form at heats approximating those used in soldering, and where the work has been slowly cooled the effect of these compounds is made evident by the appearance on the surface of the solder of dendrites which project above the softer matrix of solid solutions and eutectics which are the other constituents of the solder, and these latter, in polishing, wear away by reason of the greater hardness of the chemical dendritic crystals, and the solder after polishing has the appearance of having been channeled by the scratch-brush.

Zinc in excess imparts a sickly, grayish color to the solder, in nowise matching alloyed gold plate, and often, by reason of the formation of oxids during the preparation and working, it is structurally weak and presents a pitted appearance when cooled. Nevertheless, gold-zinc solders have an extensive industrial and dental application. Thus in the manufacture of gold ware such as ornamental vases, pitchers, plates, spoons, etc., it is the custom to assemble the first sections with zincless solder, following this with gold-zinc solders of progressingly lower melting-points for other parts, such as floral or filigree ornaments, etc., this method requiring less time and skill than would the use of the zincless type of gold solders.

In dental technical practice, large quantities of gold-zinc solders are used for assembling crowns, bridges, gold plates, clasps, orthodontia appliances, etc., and they have one advantage, in addition to their ease of manipulation and time-saving qualities, that should not be overlooked—*i.e.* by reason of the marked influence of zinc in lowering the melting-point of solders containing it, it is possible to employ solders of almost the same karat as the plate upon which they are used. As solders for dental use are stamped with the fineness, and the karat of plate upon which they are to be used is indicated, it is well to ascertain the karat of the solders themselves—that is, the number of grains of pure gold which one pennyweight of solder contains. This may be done by following the simple rule that a karat is one twenty-fourth of a pennyweight of gold—that is, 100 per cent. pure, or 1000 fine. One twenty-fourth of 1000 equals $41\frac{2}{3}$, therefore the fineness divided by $41\frac{2}{3}$ equals the karat. For example, solder of a fineness of 750 equals 18 karat, as $750 \div 41\frac{2}{3} = 18$. Gold solder $666\frac{2}{3}$ fine equals 16 karat, as $666\frac{2}{3} \div 41\frac{2}{3} = 16$. The custom of selling gold plate by karat and solder by fineness is confusing.

SILVER SOLDER.

Silver solders comprise the various percentage modifications of the Ag-Cu-Zn series, ranging in silver content from 40 per cent. to 70 per cent. with zinc ranging from 2 per cent. to 10 per cent., the copper completing the 100 per cent. Silver solders find wide application in industrial practice, as in the soldering of silver vessels and ornaments, forks, knives, spoons, and a great variety of jewelry, the assembling and repairing of certain surgical and dental instruments, and the repairing of small articles of brass, iron, or steel where strength and neatness are required. In certain industrial soldering, as in the assembling of vessels that are to be spun into shape after soldering and which require very tough solder that will stand the incidental strain, cadmium is sometimes used instead of zinc. Cadmium is not used in dental silver solders, for the same reasons that it is not used in dental soft solders.

The base of dental silver solders as well as other silver solders is the low-melting eutectic Ag_3Cu_2 (Levol's alloy), which consists of Ag 71.8 per cent. and Cu 28.2 per cent. and has a melting-point of 778° C. When this eutectic is modified by changing its percentages of silver-copper, and zinc is added to it, there are a number of reactions possible that have a bearing upon the working quality of the solder. Thus Zn forms with Ag the compounds Ag_2Zn_3, m.-pt. 830° C., making possible dendritic crystals and uncertain flow, for the same reason as given under gold-zinc solders.

When, however, these metals are alloyed together there is a profound depression in the melting-point, few silver solders requiring more than a temperature of 500° C. to fully melt them. From this it is reasoned that as the eutectic and all the compounds formed with zinc occur at temperatures well above the red heat, silver soldering should be conducted at a temperature below these critical points, but, that the solder may be fluent, somewhat above its melting-point. Also, in the use of silver solder it is well, before assembling a case, to first lightly coat with solder the surfaces that are to be in juxtaposition when finally joined. This offers a base of solder that makes for greater ease of manipulation, and saves many annoyances.

GENERAL CONSIDERATIONS FOR SOLDERING IN DENTAL WORK.

Investments should be trimmed so that the blowpipe flame has free play in all hard soldered work, as a pocketed flame is not effective. Should the case itself present corner pockets it is well to treat the investment as a crucible in which the solder is melted, and, at the moment when the solder is ready to flow, the flame is withdrawn for a moment, whereupon the solder will be seen to flow of its own accord into the pockets and completely fill them. Were the pointed flame of the blowpipe to be directed into these pockets, the solder, by reason of the force directed against it, could not bridge the gap, whereas applying the heat as suggested, *under* the pocket, draws the solder into place with the assistance of atmospheric pressure. It is better to follow the old method of soldering in a separate investment the backings to porcelain teeth, using a high-melting solder for the purpose, than to solder them when invested with the fixture to which they are to be attached. This procedure makes it possible to discover any cooling checks in the porcelain, and so saves the work and trouble of cutting out and replacing checked teeth from the finished fixture; it also affords the opportunity of better shaping-up of the backing and of more artistic work generally.

All invested cases that are to be hard-soldered should be heated gradually and uniformly, and cooled as quickly as possible with safety to the cases. Where no porcelain teeth are involved, as in removable-facing work, the cases should be quenched in cold water as soon as the solder has set, which makes for greater strength.

The thickness of hard solders is important. Zincless solders should be used in thin gages and zinc solders in thick gages—the former in order that as much surface as possible shall be at one time exposed to the flame, and the latter for the opposite reason. Hard solders that contain zinc should never be overheated.

1200 Arch st.

The Mouth as a Diagnostic Index.

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(Read before the Maryland State Dental Association, at Baltimore, Md., June 7, 1916.)

THIS article has not been written with the idea of bringing forward any new facts, but simply to call to mind a few old and well-known ones which may have been overlooked. It has been well said that more errors are caused by not seeing than by not knowing.

More interest is being shown at the present time in the specialty of dentistry than ever before, due to the fact that many systemic disturbances are now known to be caused by oral pathological conditions, a fact long contended by the dental surgeon, and at this late date recognized by the field of general medicine. Therefore the object of this article will be to impress upon dentists the aid we can give to the general practitioner of medicine in making diagnoses, and in this way rendering our patients the best service in our power.

Up to a short time ago physicians made almost no use of the valuable diagnostic information to be had by careful inspection of the oral cavity, except to give a glance at the tongue, which gives the least information of any part of the mouth. The fact of the vast amount of information to be obtained by examination of the oral cavity, which contains the largest expanse of mucous membrane and which can be examined with less difficulty than any other body cavity, is often ignored, and can only be explained by the fact that it is one of the curious traits of human nature to ignore anything that is at hand and easily available, preference always being given to the least accessible and more remote. This especially applies in connection with the use physicians make of mouth symptoms as an aid to diagnosis.

In our examination of the mouth we should always bear in mind the fact that the patient may be in serious need of the internist or surgeon, and frequently in our hands and upon us the responsibility rests of recognizing and interpreting the clinical signs found in our field, and of putting the patient in proper hands before that awful verdict has to be given, "Too late!" I am thinking now especially of cancer.

THE PREVALENCE OF CANCER IN THE MOUTH.

The responsibility of the dentist in connection with cancer is far greater than the average practitioner thinks, for according to various estimates from 9 to 26.3 per cent. of all cancers are found on the tongue, and from one-seventh to two-fifths are found in the mouth, tongue, lips, and jaws. Equally important is the estimate that one-third to one-half of all cancers are found to develop in the stomach and intestines. The rôle the mouth plays in cancer of the stomach and duodenum is easily understood when we consider the part played in the growth of neoplasms by irritation, and the statements of Mayo, Moynihan, and others that from 45 to 90 per cent. of all cases of cancer of the stomach originate at the site of an ulcer on the walls of the stomach or duodenum. Among the most frequent causes of ulcer of the stomach are unmasticated food, too much food, and constant swallowing of the contents of a septic mouth.

The figures given out by the United States census bureau for the years 1910 to 1913 show an increase of 6.9 per cent. per hundred thousand in cancer of the mouth. I hope this means that more cancers are being recognized in their early stages.

I cannot pass this subject until I call your attention to the connection between sarcoma of the jaws and alveolar abscess with fistula. Bloodgood has preached this for years. Proper examination of the mouth should be made with a good light, and with the aid of a tongue depressor, cheek retractor. mouth-mirror, and a blunt uterine curet to use in the examination of tonsillar crypts for exudative material; also a laryngeal or small mouth-mirror. Examination should include the lips, entire mucous membrane, gums, fauces, tonsils, glands of mouth, floor and roof of mouth, and teeth.

In this article I shall confine myself to the above-named structures, but a careful dentist will certainly inspect the face and head.

The condition known as acromegalia is so characteristic, with the huge lower jaw often referred to as "whopper jaw," prominent cheek bones and the well-marked bony ridge above the eyes, that it can be recognized at a glance, and is of special interest at this time on account of the regard being shown to the functions of the so-called ductless glands. Acromegalia is only one of many conditions which can be diagnosed by a careful inspection and palpation of face and head.

An examination of the mouth is incomplete without noting the character of the odor of the breath, as a foul breath is nearly always due to nose, throat, or mouth conditions. A coated tongue answers for a large number of cases of foul breath, or it may come from intemperance in eating and drinking, causing portal engorgement. This means an engorgement of the mucous membrane of the nose, throat, and mouth, and interferes with the functions of the mucous glands and causes them to retain a portion of their excretory products.

Gastric disturbances, adenoids, tonsillitis, chronic bronchitis, or a chronic low-grade nephritis may be responsible for foul breath. An ammonia-like breath may be an indication of uremia; an acetone breath indicates acidosis. This is interesting, especially as a large percentage of cases of cyclic vomiting in children is caused by acidosis.

We shall now consider in detail the contained organs of the mouth as diagnostic indices.

THE LIPS.

Pallor suggests anemia; cyanosis, if marked, indicates heart lesions, lung diseases such as tuberculosis, and emphysema, or poisoning by coal-tar products. One should be careful to look for the presence of lesions of syphilis, such as mucous patches, chancre, and white linear scars radiating from the corners of the mouth, which indicate healed specific lesions, probably of congenital origin.

Tubercular lesions can be differentiated from chancre by the hard, indurated, painless condition of chancre in contrast with the very painful, clear-cut margins of tubercular lesions. Herpes is usually present in diplococcic infections. Angioneurotic edema and enlargement of the lips in myxedema and cretinism should be specially noted, and last but by no means least, the presence of a long-standing lesion may mean epithelioma and is always a precancerous lesion.

MUCOUS MEMBRANE.

Valuable information in regard to the circulation can be obtained from the mucous membrane. Paleness suggests anemia; pigmentation and brown spots suggest Addison's disease. Purple patches may indicate purpura hemorrhagica—capillary pulsation can be seen upon the inverted lower lip. It is not necessary to call your attention to the sluggish gingival circulation as an index to constitutional changes in remote parts of the circulatory system.

The first signs of this are found in the mouth. The exanthemata nearly all show in the mouth; the well-known Koplik's spots in measles enable one to make a diagnosis a day or two earlier in this disease. They are found upon the inside of the cheeks opposite the line of closure of the molars, and appear as small bluish-white spots each surrounded by a red areola.

The mouth of the pellagrin is fairly characteristic. The mouth symptoms of this disease in its earlier stages consist of a deep red blush in the region of the tonsillar pillars, spreading up over the soft palate and roof of the mouth.

I have often noted in patients suffering from diseases of the central nervous system the presence of imprints of the teeth on the cheeks. Typhoid fever is shown in the mouth by the presence of Bouveret ulcers. These are kidney-shaped, with the concavity toward the median line, and occur as early as the seventh to the tenth day, and are usually found symmetrically placed on either side of the fauces just above and at the outer side of the tonsils; rarely, on the uvula, or at the junction of the hard and soft palates.

In this connection drug rashes should be mentioned. Skin diseases often show mouth symptoms. These may be divided into two classes—those in which the mouth lesions are extensions of the skin lesions, and those that appear in the mouth before the skin lesions, and even sometimes without any skin lesions at all. Eczema is an example of the first class, and lichen ruber planus is an example of the second class.

GUMS.

All inflammatory and suppurative conditions, especially the existence of fistulous openings and the presence of the lead line, should be noted on the gums. The lead line is not really a line, but a series of dots and lines near or upon the gum margin; they are gray or black in color. In the absence of teeth there is no lead line. If the mouth specialist would observe this so-called lead line, it would not always be necessary for the patient to develop the wrist-drop before diagnosis of chronic lead poisoning.

FAUCES AND TONSILS.

Ulcerations, inflammation, and swellings should be looked for in the fauces and tonsils. In acute leukemia one finds changes in the tonsils and lymphoid tissue of the mouth. The tonsils and sometimes the base of the tongue are covered with foul necrotic ulcers, which bleed easily and cause much pain. The adjacent cervical glands are enlarged and tender. The enlarged tonsil is not the only type that is dangerous, for often the small buried tonsil is a serious menace. I have already referred to squeezing the tonsillar crypts to ascertain the presence of exudative material. Ulcers on tonsils, except simple ulcers, are usually due to tuberculosis or syphilis. Yellow white spots on the tonsils are indicative of follicular tonsillitis. A grayish white membrane over the tonsils and soft palate means diphtheria.

TONGUE.

Observance of the manner of protrusion of the tongue may give valuable information as to the condition of the nervous system. Tremor is seen in alcoholics and dementia paralytica. If the tongue is protruded to one side it may be an indication of facial paralysis. A coated tongue is of no practical use in diagnosis, as the appearance of the tongue does not reflect the condition of the stomach at all. It is estimated that about 60 per cent. of apparently healthy people have coated tongues. The presence of leukoplakia is of interest, and is classed as a precancerous lesion, and I must again call your attention to the importance of any precancerous lesions, especially on the tongue. A slick red tongue suggests chronic gastritis. The presence of specific and tubercular lesions is to be borne in mind.

GLANDS.

We should palpate carefully, particularly the floor of the mouth, for enlarged glands. The presence of ptyalism should be noted. The condition of aptyalism is interesting. I have seen two cases where the individuals had to use a lubricant such as vaselin for their mouths and tongues.

TEETH.

This being a body of dentists, it is not within the scope of this paper to discuss this phase of the subject, but I wish to add what I have often said to students, "When you look into a mouth, please see something else besides teeth."

In closing, I would like to read the concluding paragraphs of Manges' paper referred to in the list of references. This paper was written by a physician and read to a general medical society, and is an indication of the interest that is being shown in this subject, and also what is being demanded of the mouth specialist at this time:

> In conclusion, it would not be amiss to say a few words about the value of mouth inspection in the treatment of patients. Of what avail is it to bombard the stomach with drugs and to diet patients, when the real cause of the symptoms lies in a foul mouth, missing teeth, filthy bridges and plates? Why prescribe sedative cough mixtures when a long uvula is the cause of an obstinate cough? Why fill a child with tonics when adenoids and enlarged tonsils are the cause of anemia? The tonsils are the cause of so much constitutional mischief that they should always be examined as a routine process. Especially important is this examination in all cases of articular rheumatism, chronic or even acute nephritis, and all cases of sepsis.
>
> The care of the mouth would be attended to more carefully in all acute diseases if physicians now and then looked into the fauces of their acutely ill patients. It is surprising how often we can find foul conditions, the correction of which by very simple measures adds immeasurably to the comfort of the patients, and enables us to feed them more readily; while a dirty mouth destroys the appetite, and, moreover, infects every morsel of food which enters it. Recent researches have proved that in all acute illnesses the digestion and absorption of food are but little below that of health, and, moreover, that all infections can be fought better by patients if the waste of the body tissues is prevented. The patient should be properly fed, and a full supply of calories should be allowed to him. Keeping the mouth clean is the first and a very important stage in securing this end.

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915½ E. MAIN ST.

An Interesting Case of Auto-infection.

By EUGENE S. TALBOT, M.D., D.D.S., Chicago, Ill.

THE patient, born about thirty-four years ago, was a perfectly normal healthy female child. She was vaccinated at one year of age, which was followed by a periodic fever. This succumbed to small doses of quinin, and the usual robust health followed. When three years of age there occurred another illness resembling scarlet fever. There were no typical symptoms upon which to base a diagnosis, although there were many cases in the neighborhood at that time. Swelling of the glands of the neck followed. Some time between the age of three and four years there occurred a severe attack of vomiting, which lasted several days, and later at intervals of one or two months until she was nine or ten years of age.

At about five years of age there occurred a mild attack of whooping-cough, followed by measles, which left no bad results. All this time the glands of the neck remained swollen, and there was some suppuration, which became worse at about seven years of age. At this time four lower teeth, presumably deciduous, were badly decayed and loose, but as she was very nervous their extraction was somewhat delayed.

When a little over eight years of age there was an attack of pneumonia, and after the lungs cleared up there occurred a severe attack of fever lasting several weeks. In spite of the best of care, the glands in the neck remained troublesome, and when the patient was sixteen years of age they were removed by a surgeon. The result was helpful, but not entirely satisfactory, as she has continued up to the present time to have some return of the trouble at intervals of from one to three years. She was treated at various times by the X-ray method, and, as she thought, with fairly good results. Later, however, the swellings in her neck did not yield to the X-ray treatment.

Although her general health has been good most of the time, the scars on her neck from the operation and the enlarged glands which were always present were a source of great annoyance to her.

Her father, a physician, was one of the ablest medical teachers and writers in the country. He was always noted as being an exceedingly well-informed man. Although this young woman appeared to be in the best of health and the latest methods of diagnosis were always applied, she was supposed by her father to be tuberculous, although negative results appeared when examination of the pus from the glands was undertaken. Her father frequently remarked that the absence of the tuberculous bacilli did not necessarily prove that tuberculosis was not present. She was cared for in the usual way, *i.e.* living in the country, with an abundant diet, and plenty of fresh air.

She first came into my practice in 1901. Her teeth and mouth were in an exceedingly bad condition; nearly every tooth in her mouth was decayed, and cavities were present at the cervical margins of most of the teeth. The gums were hypertrophied, inflamed, and bathed in acid secretions. It was with difficulty that I was able to prevent decay. With a vigorous use of the "gum-massage brush," iodin, and the sulfocarbolate of zinc treatment, I was able to restore the gums to health and reduce the ravages of decay.

The first root-treatment and filling was performed by myself February 7,

1913. The following teeth had been treated, and roots and crowns filled before she came into my practice: Lower right second bicuspid, upper right second bicuspid, and upper left second bicuspid, making four dead teeth in her mouth in 1914. There was no means of knowing how long these bicuspid roots had been filled. From their appearance, however, and from the fact that the glands in her neck were always swollen and tender, I am led to believe that they had been treated and filled very early in life.

In 1916 a gland in the right side of the neck swelled to the size of a hen's egg, and two glands on the left side were about the size of English walnuts, very sore and painful. The large gland on the right side of the neck did not inconvenience the patient in the least.

An X-ray picture was taken of the four dead teeth and abscesses were found upon the roots of each. The patient never experienced any pain or swelling, nor had these teeth given her the least inconvenience. All this time, so far as her general condition was concerned, she was in perfect health, good appetite, slept well, and attended to her daily affairs with contentment and pleasure.

On June 19, 1916, three teeth were extracted; the swellings subsided on the left side of the neck and the soreness entirely disappeared. The large swelling upon the right side was reduced to about half its size, but still remained. On October 17, 1916, the fourth dead tooth was extracted on that side of the jaw, and the swelling completely disappeared.

CONCLUSIONS.

The interesting part of this history is the fact that from the time the patient was three years of age there had been a continuous glandular enlargement and soreness in the neck. This glandular enlargement showed that from one cause or another she had been continually poisoned. The removal of the diseased glands at sixteen years of age did not prevent others later from becoming involved.

It was supposed by physicians that she was tuberculous. From the history it would seem that the glands of the neck absorbed all the germs, since infection of other tissues or organs of the body did not occur. Glands in the axilla or groin never became involved. The infections, therefore, always developed about the head, face, mouth, and throat.

The tonsils, nose, and sinuses have always been in a fairly healthy condition. Since the removal of the abscessed teeth, however, the glands of the neck have been reduced to normal, and the soreness, for the first time since the patient was three years of age, has entirely disappeared. Although the initial cause was due to scarlet fever or a similar disease, the continued infection was no doubt due to the teeth.

31 N. STATE ST.

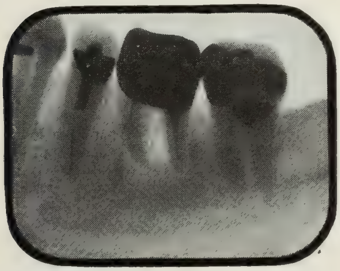
Devitalized Teeth.

By GEO. ROSENBAUM, M.D., Philadelphia, Pa.

(Read before the Pennsylvania Association of Dental Surgeons, at Hotel Stenton, Philadelphia, Pa., December 12, 1916.)

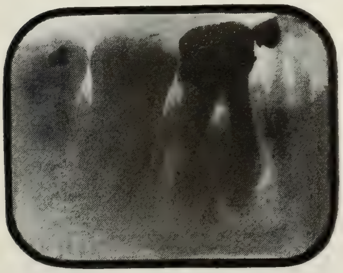
THE basis of this paper is the study of a series of five thousand cases of devitalized teeth made during the past two years. The deductions and conclusions arrived at are merely my own opinions, and are in no sense to be regarded as in the nature of adverse criticism or fault-finding. The treatment of pulpless or devitalized teeth has been termed a disgrace, but I do not so consider it. To my mind it is merely a mistake, and so may be more or less easily overcome.

FIG. 1.



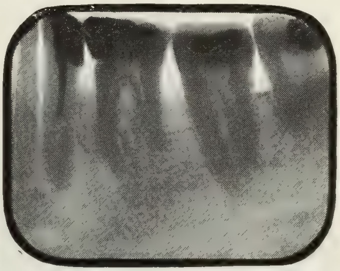
Pericemental abscess on first molar.

FIG. 2.



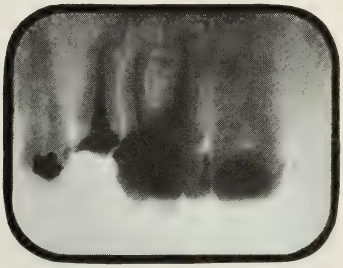
Extensive hypercementosis with abscess of both roots of first molar. Note clubbing of roots compared with second molar.

FIG. 3.



Large apical abscess on second bicuspid.

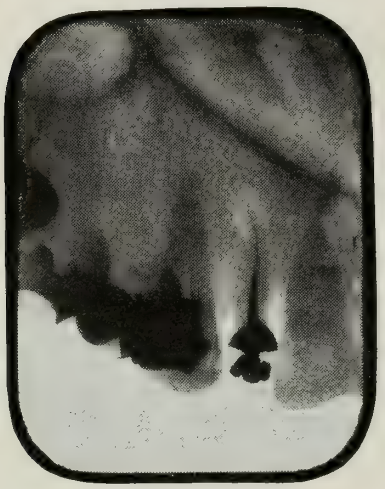
FIG. 4.



The anterior buccal root has a perfect filling, but is abscessed. The palatine root-canal filling is pushed through, but there is no abscess.

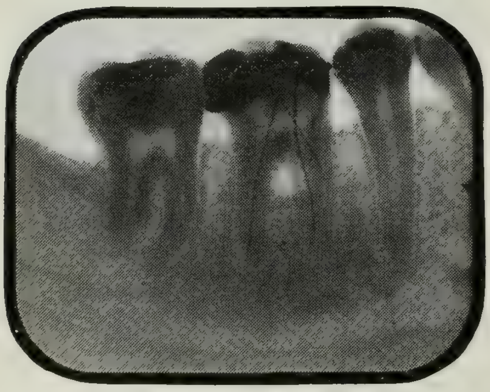
The startling frequency of periapical abscesses, particularly in teeth that have been devitalized, has left a profound impression upon the mind of the thinking and conscientious dentist. Statistics from the clinic of Dr. Frank Billings, at the Presbyterian Hospital, Chicago, furnish valuable data on 1132 periapical infections, ranging from small areas of rarefaction to gross bony lesions, of which 994—87.5 per cent.—were devitalized teeth, with varying degrees of root-canal filling. In my own statistics 92 per cent. showed abscesses in devitalized teeth. This higher percentage may be explained by the fact that most of these cases were abnormal in the first place—that is, they were referred to me because the patient complained of subjective symptoms or because objective

Fig. 5.



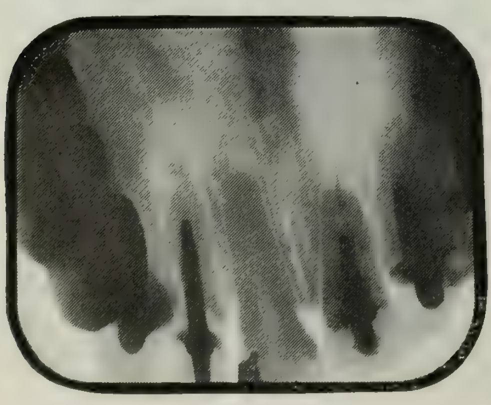
Perfect root-canal filling—abscess.

Fig. 6.



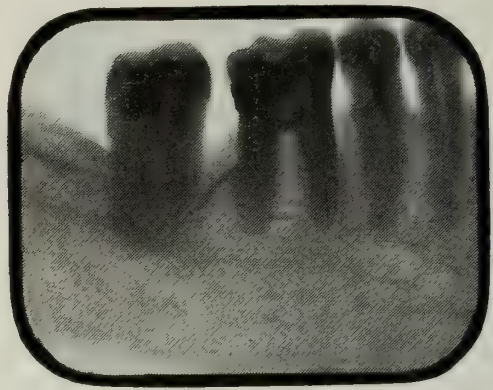
Light area between roots of first molar shows a pericemental abscess. Broaches in root canals.

Fig. 7.



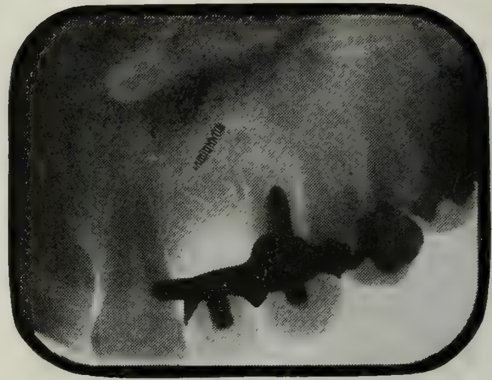
Extensive abscesses with bony necrosis and absorption of centrals and laterals. Left central shows root-canal perforation.

Fig. 8.



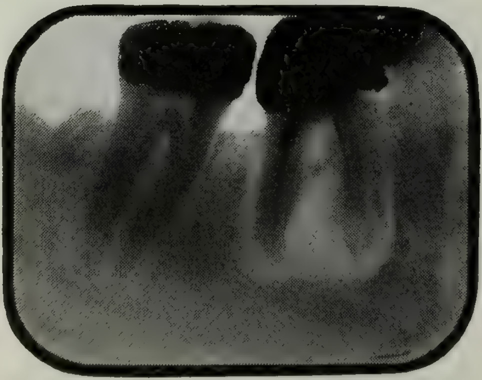
Alveolar absorption. No apical abscesses.

Fig. 9.



Point of fissure bur broken off in attempt to do apicoectomy of abscessed cuspid.

Fig. 10.

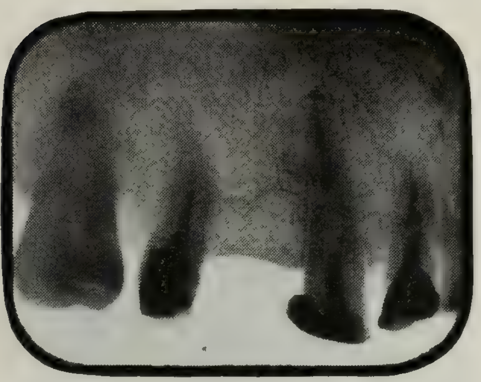


Large area of bony necrosis around first molar apices. This tooth cannot be saved.

ones were seen or suspected by the dentist.

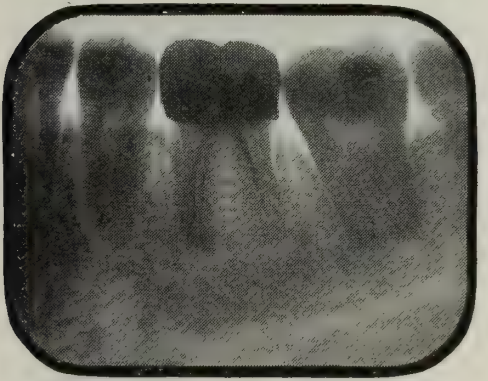
These are figures which cannot be ignored, nor their importance minimized.

Fig. 11.



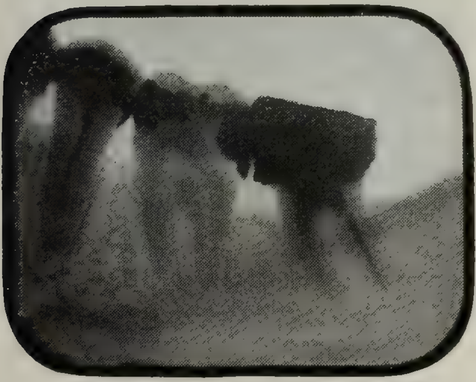
Varying degrees of root-canal filling. The lateral root shows a perfect filling, but abscessed. The cuspid has a filling which perforates but does not cause abscess. The second bicuspid has a fair filling and no abscess.

Fig. 12.



Apical abscess of first molar.

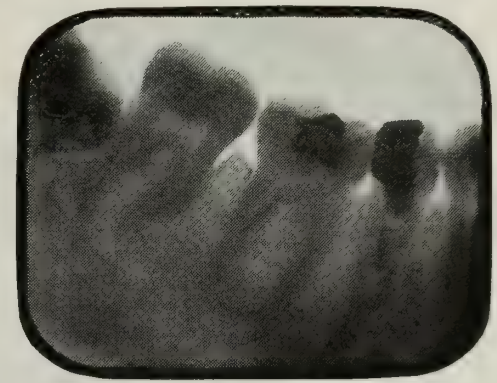
Fig. 13.



Note overhang to second molar crown.

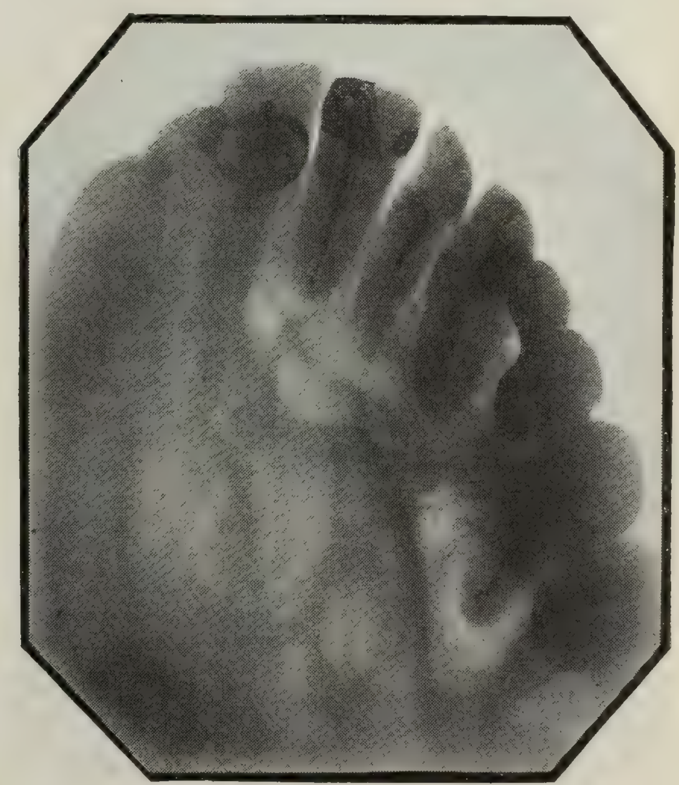
A devitalized tooth is a potential menace, and should always be looked upon with suspicion. Very few of the ills that the human economy is heir to have not been blamed upon oral sepsis, and the question is still a much-mooted one. Cause and effect are still confused, but we all agree, or should agree, that infections in and around the teeth may, and very often do, lead to serious systemic metastatic disturbances.

Fig. 14.



Impacted third molar.

Fig. 15.

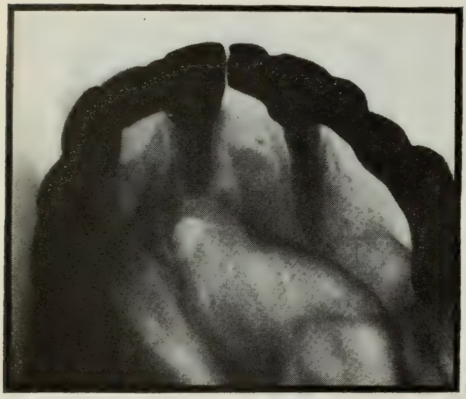


Perfect root-canal fillings in central, lateral, and first molar, but each has a large apical abscess.

The death of the dental pulp has been very properly called a calamity, and when it does occur, it should be considered as such.

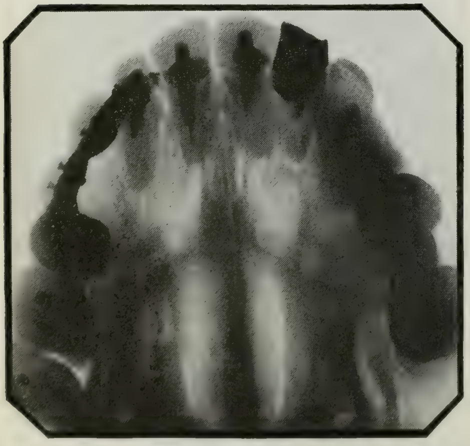
The keynote in the campaign should be prevention prophylaxis. Prevent or control caries and pyorrhea and the problem is nearly solved. Give careful attention to the filling of the small cavities, and thereby lengthen the life of the pulp. Unfortunately, however, even the presence of a small metallic filling will eventually produce some deleterious change in the pulp.

Fig. 16.



Persistent pus from sinus under bridge due to unsuspected abscessed root.

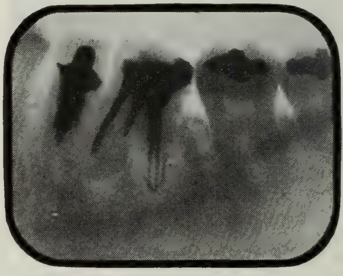
Fig. 17.



Extensive apical abscesses of centrals and laterals. Left lateral devitalized for a bridge. It became abscessed, and was ultimately extracted.

Curiously enough, devitalized teeth and apical abscesses are rare among the poor, and the reason is apparent. When a poor patient has an aching tooth, he has the offending tooth extracted, because he cannot afford tedious and expensive root-canal work.

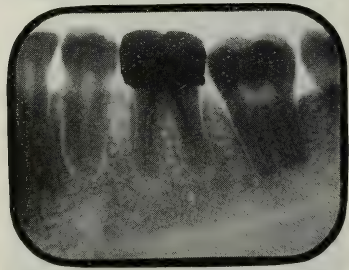
Fig. 18.



Apical abscess with necrosis and absorption of distal root of first molar. Gutta-percha pushed through.

Etiologically tooth infections may be classified as primary and secondary. The primary, and by far the most frequent, are caused by infected pulps; they are also caused by poor surgical technique in root-canal treatment, carelessness in the use of irritants and caustics, and faulty fillings in the pulp chamber and root-canals.

Fig. 19.



Slight apical and pericemental inflammation of first molar. Fair root-canal fillings.

The secondary infections are bloodborne.

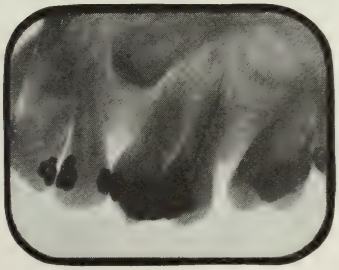
The solution of this vexing problem, as advocated by some, consists in the very radical measure of promiscuous extraction of all pulpless teeth. This is undignified and unprofessional. But when one considers the frequency of infections around pulpless teeth, the situation looms up large and formidable; palliative measures will not suffice. In view of the diversity of opinions the problem we have to meet will, in all likelihood, be solved by the substitution of one or more new problems in place of the old one.

The treatment of pulpless teeth readily divides itself into two parts—(1) prevention and (2) treatment of the infection.

To my mind a proper root-canal technique will almost entirely eliminate the occurrence of infection. A thoroughly aseptic operation and the very careful use of strong irritants and caustics will, in ninety-nine out of a hundred cases, insure against subsequent infection. (See Figs. 4, 15, and 20.)

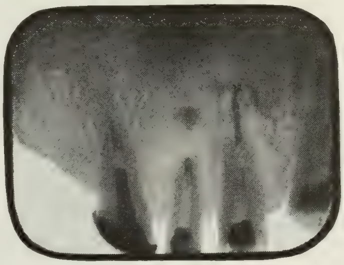
In view of my experience and my statistics, I believe that it is wrong to devitalize a perfectly normal tooth in order to secure anchorage for a bridge, because very often this tooth becomes infected, and is ultimately lost. (See Fig. 17.) Apical abscesses and periapical infections rarely occur in vital teeth. As to treatment, extraction of course at once removes and cures the infection, and in spite of the justifiable reluctance of the dental profession to sacrifice a tooth, must stand first as an effective treatment of infection caused by devitalized teeth; then comes root amputation with curettage, and lastly, treatment and drainage through the root-canal. The last measure, drainage, should be very cautiously employed, particularly in the lower teeth. Surely it is poor surgery to expect resolution in an area of bony necrosis that is drained by a thin capillary tube like a root-canal. But if treatment be instituted, and in many cases it is the proper thing to do, the result desired should be promptly evident. If the desired result is not evident, and if the comparative roentgenograms show no improvement in the condition, say after six months, then radical measures should be employed.

FIG. 20.



Root-canal filling perforates, but does not cause abscess. Impacted cuspid.

FIG. 21.



Varying degrees of root-fillings.

Much has been written about the necessity for filling root-canals exactly to the apex—so much so, in fact, that we have lost sight of the prime factor in this operation, namely, surgical asepsis. The aseptic mechanical reaming of canals is far more important than the medicinal treatment. It is well to bear in mind that a tooth with an aseptic root-canal filling that extends only half-way into the canal or all the way through the apex is immeasurably less likely to cause trouble than one in which a perfect root-canal filling exists, but which is surgically unclean. (See Fig. 15.)

To sum up tersely, two reasons exist for failures with pulpless teeth—first, filling canals of teeth already hopelessly diseased (see Fig. 10), and second, failure to observe strict surgical asepsis.

912 FLANDERS BLDG.

CORRESPONDENCE

"Taking Impressions: Materials and Methods."

To the Editor of the Dental Cosmos:

Sir,—Dr. D. D. Cornell's letter relating to "Taking Impressions: Materials and Methods," published in the March issue of the Cosmos, has the right ring to it, and I fully agree with what he says of the great majority of dentists and commercial laboratories. I am no novice in the laboratory business, and know that there would be no cause for their existence if the large majority of dentists of whom Dr. Cornell speaks knew anything about the art of plate-making.

Notwithstanding the writings of Prof. Geo. H. Wilson, I see no fallacy in the Green or Supplee method of taking impressions, and my experience has taught me that the more difficult the impression the more need I have for the compound. In my practice I have not taken a plaster-of-Paris impression or made a plaster-of-Paris model over which to make a denture, in four years; I have no use for it where expansion or contraction is to be avoided. As to the side-stepping of prosthetic dentistry by dental graduates, can we not safely say that the side-stepping has not all been on the side of the graduate?

Before answering Dr. Wilson's three pertinent questions I may say that I have found it sometimes necessary to avoid all the tautological theories one has acquired, and go it alone to meet the exigency at hand.

"*Q.* (1) Why do you exclusively adopt modeling compound?"

A. I do not.

"*Q.* (2) Do you believe every dentist can manipulate compound successfully?"

A. I do not—nor anything else.

"*Q.* (3) Do you know there is much unconscious deception in impression taking with compound?"

A. I have not found it so in my own experience.

Respectfully yours,
E. C. French, D.D.S.

Eau Claire, Wis.

DENTISTRY IN THE WAR ZONE.

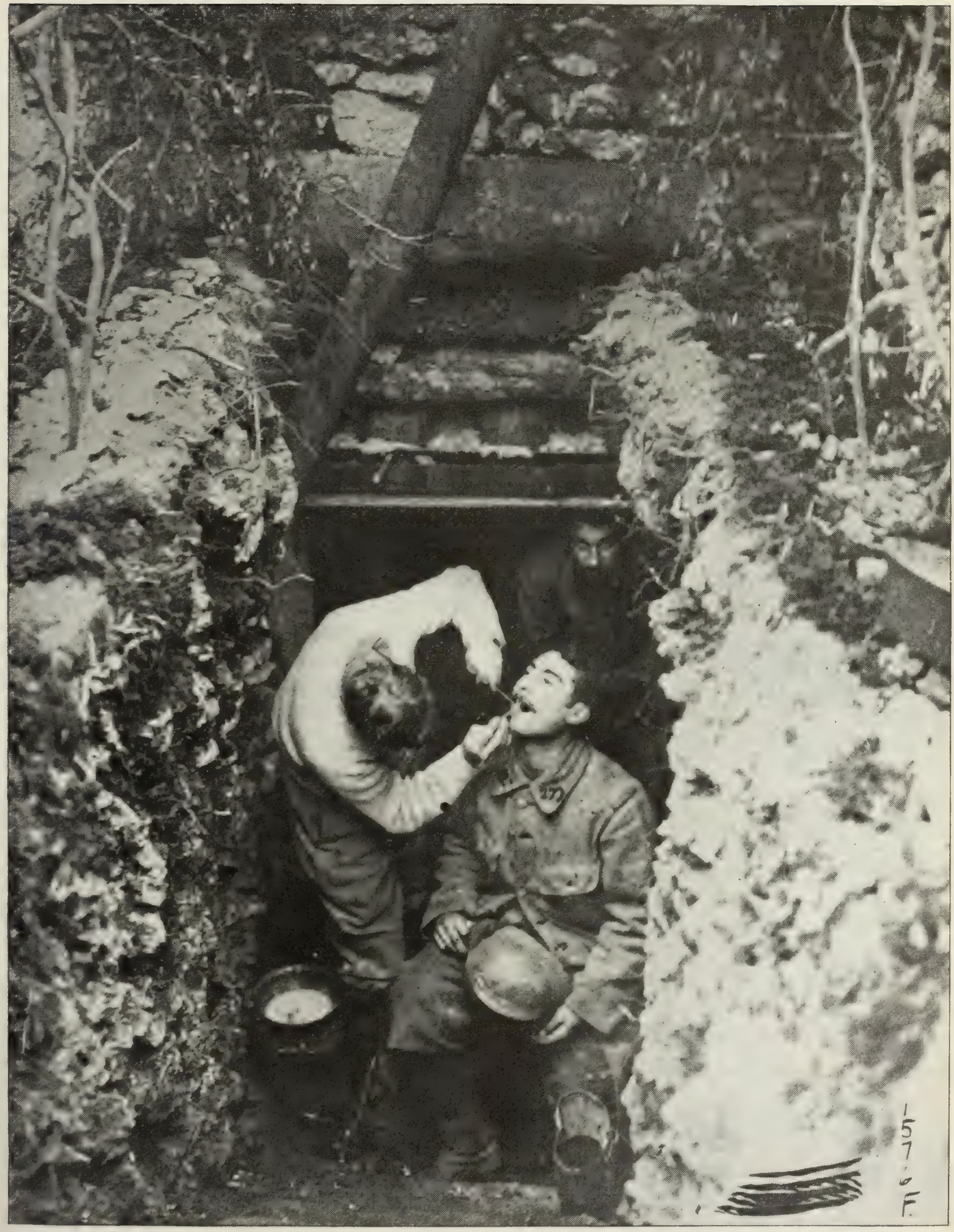


Photo by International Film Service.

A French official photograph just received in this country, showing a French dentist at work at the entrance to a trench avenue. The daring French poilus fear the dentist more than the shells and shrapnel that are hurled continuously at them. ("No; they do not administer gas in the extraction of teeth, on the battle-front.")

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Eastern Association of Graduates of the Angle School of Orthodontia.

Regular Meeting, held in New York City, November 25, 1916.

A REGULAR meeting of the Eastern Association of Graduates of the Angle School of Orthodontia was held on Saturday evening, November 25, 1916, at the Hotel Manhattan, New York City.

An afternoon clinic was held at the office of Dr. Frank A. Gough, Brooklyn, N. Y., at which the new Angle Ribbon Arch and Appliances were demonstrated by Dr. F. A. Gough and Dr. R. H. W. Strang.

The evening session was preceded by a dinner, at the conclusion of which Dr. H. C. Ferris, the president, called the meeting to order.

Dr. Ferris introduced as the speaker of the evening Dr. LOUIS E. BISCH, New York City, who read a paper entitled "Diagnostic Methods in Determining Feeble-mindedness."

[This paper is printed in full at page 496 of the present issue of the COSMOS.]

DISCUSSION.

Dr. Milo Hellman, New York City. The relationship between physical defects and mental disturbances has always been a favorite topic among people of all times. The association of these two phenomena has ever been over-emphasized, and their significance exaggerated. It is not so many years ago that a certain peculiar look in the eye of an individual would cause the population to fear him; the superstition being that such a person possessed an "evil eye," and therefore an evil mind. On the other hand, the individual with "crooked" teeth in his mouth was stigmatized as a degenerate. However, with the progress of civilization and advance of science, we have been enlightened to the extent that such beliefs are not entertained so much now as in the past.

The essay of the evening, though of profound interest in itself, is of little value in the solution of problems involved in orthodontia. The only *bona fide* data, from the dental viewpoint, pertaining to feeble-mindedness, dates back to about 1875. The first theories advanced on this subject are attributed to Dr. J. Langdon Down, who was at the head of the Earlswood Asylum for the Feeble-minded, in England. Among other things he claims to have made "a very large number of careful measurements of the mouths of the congenitally feeble-minded and of intelligent persons of the same age, the result indicating, with some few exceptions, a markedly diminished width between the posterior bicuspids of the two sides. . . . One result, or rather one accompaniment, of this narrowing, is the inordinate vaulting of the palate, which assumes a roof-like form. The vaulting is not simply apparent from the approximation of the two sides; it is absolute, the line of junction between occupying a higher plane." Dr. Down further concluded that the "V-shaped" palate was characteristic of a very large class of idiots, and that a certain peculiar-shaped palate was pathognomonic of congenital idiocy.

Dr. Norman W. Kingsley, who did not agree with these conclusions, visited the Earlswood Asylum, and together with Dr. Down examined the palates of the inmates. After the examination of every inmate Dr. Kingsley was quite well satisfied with the fact that the result was not very different from what he had expected. "There were, to be sure, a larger percentage of irregularities of the teeth than I had ever before observed," says Kingsley. "About two per cent. might be said to be pronounced cases of narrowed or V-shaped arches, and another five to ten per cent. might be said to have more or less tendency in that direction; but of the more positive cases I did not see one so marked as I have seen and treated in private practice, and associated with full intellectual development."*

The question then remained open until Dr. Walter Channing in 1897 published a paper on the "The Significance of Palatal Deformities in Idiots." Based upon the study of models made of the palates of one thousand feeble-minded individuals and five hundred school children, Dr. Channing arrived at the following conclusions:

(1) Two-fifths of the palates of idiots are of fairly good shape.

(2) Palates of normal individuals may be deformed.

(3) In idiots it is a difference in degree and not in kind.

(4) In either case it shows an irregular development anatomically.

(5) Palates of average children and idiots under eight years of age probably do not in the majority of cases markedly differ.

(6) There is no form of palate peculiar to idiocy.

(7) The statement that a V-shaped or other variety of palate is a "stigma of degeneracy" remains to be proved.

After augmenting the collection of models by the addition of a large number of those of normal individuals, Dr. Channing submitted the material to Dr. Clark Wissler of the American Museum of Natural History of New York, for the purpose of "retroversing former conclusions, and proving or disproving them." This was accomplished by a thoroughly recognized scientific method.

The premises under which the investigations were undertaken by Dr. Wissler comprised a few general statements. For instance, "All problems involving comparisons of morphological types," Dr. Wissler states, "must concern themselves with variation; furthermore, certain assumptions underlie all procedure in such problems. It is assumed that whatever may be the number and nature of the causes tending to project an organ into space, the objective is definite, constant, and fixed. This assumption is based upon observed facts." In the general discussion of results, it is of interest to note the finding of "evidences of a slight difference in degree, but not in kind, of variability between the normal and the feeble-minded."

The causes of irregularities Dr. Wissler attributes to early cessation of growth. He shows that, in the feeble-minded, growth is completed somewhat earlier than in the normal, and therefore as the completion of the growth of the palate occurs sooner than in the normal, it does not proceed harmoniously with the eruption of teeth. The teeth therefore become crowded, and a greater percentage of irregularities in the feeble-minded is the result.

In his summary of the investigation, Dr. Wissler refers to the result thus: "This has shown, so far as our data go, that the general type of the palate, as defined by the measurements taken, is the same from the feeble-minded as from the normal individuals."*

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* Kingsley: "An Inquiry into the Causes of Irregularities," etc., 1875.

* To those who are interested in this subject I can highly recommend the work "The Hard Palate in Normal and in Feeble-minded

We may therefore conclude that so far as we are concerned the problems of the feeble-minded, though of extreme intrinsic interest to the psycho-therapeutists, orthodontically, however, present no differences in complexity other than those of normal individuals, and that the solution of them is probably to be found in a realm hitherto unexplored by science.

Dr. Bisch. I am very glad the question of the deformity of the palate in the diagnosis of the feeble-minded has been brought up. Dr. Ferris and I have just been discussing it.

The so-called stigmata of degeneracy include not only malformations of the jaw but also such abnormalities as almond-shaped eyes, anomalies of form and size of the nose, lips, tongue, etc. We do not take much account of these stigmata, however, unless we have three or more well-defined ones. Almost every normal individual has at least one stigma. But suppose you are examining a case and there is a question as to whether the child is feeble-minded or normal. If the purely mental diagnosis is doubtful, but the child has three or more well-defined stigmata, we are apt to call it feeble-minded. Although we are trying to belittle the emphasis of stigmata, on the other hand we do take it into account when diagnosing cases, especially borderline ones. That is just when we should be most careful.

It seems that the orthodontists could gather very valuable data as to the formation of palates in connection with feeble-mindedness. Langdon Down and Kingsley, it seems to me, do not make the distinction between true feeble-mindedness and mere retardation. They group all as feeble-minded because they are below normal; but a feeble-minded individual is a distinct type. He often has certain physical earmarks, while his mental reactions are characteristic. The question of stigmata is a very important one, and one to which you gentlemen can contribute a great deal. The psychiatrists and orthodontists should work together.

Lombroso held, of course, that there was such a thing as a distinct type of face which characterized the criminal. I had occasion to conduct a so-called "psychiatric laboratory" at police headquarters for eight months. It was my business to visit the line-up of criminals each morning, where the prisoners ranged from pickpockets to murderers. I found many confirmed criminals who showed absolutely no signs of degeneracy, while others whom I selected from the line-up because they had marked stigmata proved to be normal mentally. At present the matter of stigmata is not definitely settled, and personally I think it is wrong to call them stigmata *of degeneracy*. However, I think it has already been fairly well established, although perhaps only recently admitted, that correcting a malformed palate or mouth in a case of mental sluggishness will improve the mentality.

Dr. C. A. Hawley, Washington. The subject is very interesting indeed, and I do not know when I have heard a clearer paper.

I might mention one case of interest. Some years ago a boy was brought to me who was the son of very wealthy parents, and yet he was evidently a mental defective of some kind. The lower arch was in mesial position—what we call a class III case. The mother, as is the case with most mothers, could not be convinced that the child was not a very bright one, while everyone else could see that he was mentally defective. She was very anxious that everything possible should be done for him. He had had adenoids and enlarged tonsils, which had both been operated on, and then she conceived the idea that the correction of his teeth would help him. It did not, however, have any effect whatever on his mental condition.

What Dr. Bisch has just said reminds me of what a prominent official of our police force said some time ago. He said that you could not tell positively whether or not a man was a criminal by seeing

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Individuals," by Walter Channing, M.D., and Clark Wissler, Ph.D., American Museum of Natural History, vol. i, part v, as most interesting, very stimulating, and highly scientific.

him. On the street, to all ordinary observation he was just as good-looking a man and just as normal-looking as anyone else. It was entirely a matter of history—what the man had done.

A good many years ago, when I first started practice, I had a very close acquaintance with Dr. Bowman of Columbus, Ohio, who had for many years been dentist to the imbecile asylum in the city. It was my custom to accompany Dr. Bowman twice a year on his regular visits, to extract teeth for the inmates at the institution. I noticed some things then that I am reminded of by this paper, and that seemed to me at that time remarkable.

His procedure was to have a room where he had his chair and extracting instruments, and these patients were brought to him. There did not seem to me, as far as I remember and noted at that time, any particular difference in the appearance of their mouths.

One thing that impressed me, and which Dr. Bowman mentioned to me at the time, was that there was a certain type of child that seemed to enjoy having teeth extracted, and in those cases there did not seem to be the slightest evidence of pain. There was another type, usually strong men, that had to be brought in by four or five attendants. They were strong, rugged people, and yet they were mental defectives.

I wish I could go through another experience of that kind, so that I could observe those things more carefully. I think that here is a very fertile field for knowledge, and one that I consider would be productive of a great deal of good.

Dr. Ferris. Pursuant to this subject, I have in my office as assistant one of Dr. Bisch's students, who is doing this work in the Postgraduate Hospital. I have had one or two cases in practice that have taken the Binet test, and are under treatment at the present time. The point is to know whether in these retarded cases we actually produce a mental benefit to the patient; and there is no better way we could do it, without putting them in the hands of a specialist, which probably would be the best method, than to use the Binet test. The Binet test is made by a student who is competent, and the records may be of benefit to us for future study. While we have a decided indication by this simple test for feeble-mindedness, it would be advisable for us to have a more careful and scientific investigation of all the symptoms that are presented at the hands of a specialist like Dr. Bisch. It is a question that should be given very careful consideration, because at the present time there is a great deal of interest being taken in the subject, and I may say that at the Postgraduate Hospital in New York I learn that the clinic is overrun —they have more patients for examination than they have assistants to do the work. It is only recently, within the past year, that such extreme interest has been taken. It is a question of intense interest to me—as, I am sure, to all of you—and I am personally very grateful to Professor Bisch for coming before us.

Dr. Mershon. Is there any method by which we can distinguish between a traumatic condition and a mental defective? How can we determine the difference?

Dr. Bisch. In all cases, you first have to make a distinction between the congenital cases, where there is probably some hereditary defect handed down, and those cases which I am pleased to call cases of "arrested development," which have been born normal, and have remained normal for some years before something happened.

If a child talks at one year, walks at one year, holds up its head at four months, has its first tooth at six months, or thereabouts, and the fontanels close at the proper time, and then at the age of three years the baby falls down the fire-escape or sustains a severe physical injury, the probability is that you are not dealing with a case of congenital normality, but of arrested development producing amentia, and due to trauma.

I would caution you to get proper information. Nearly every parent is sensitive about his own feeble-minded child. If you ask, "Did the baby have a fall?" the answer is, "Oh, yes; it fell out of the baby-carriage at such and such a time." Now, all children have falls, and parents generally attribute backward mentality to that. I generally ask, "Was the child unconscious? Did it have a convulsion? You say the child changed mentally—how did it change? You say the child could talk; could it use words and sentences? After the fall, could it still use words and sentences?" And so on. By detailed and careful questioning you generally catch them, if they are trying to deceive you deliberately.

The question of rhachitic teeth has been brought up. That often causes a great deal of trouble in differential diagnosis, so far as mentality goes. You often see marked malformation of the teeth, yet the children are normal. For example, the case of Hutchinson's teeth which Dr. Ferris says presents a negative Wassermann. One cannot make a diagnosis on teeth alone. If rhachitic teeth are suspected, see if the child has other marks of rhachitis. Has it a square head? Has it bow-legs? Has it knobbed ribs? Some say that a normal child can be rendered an ament through rickets. I personally do not think so. I do not think that rhachitis, which is a nutritional disease, can cause "arrested development" in that way. That it can cause retardation, I think there is no doubt whatever.

Dr. Grieve, Toronto. Has anything been done to follow up the thought that impacted teeth have their effect on the moral development and criminal tendencies? Some people believe impacted teeth have a decided effect in causing a certain amount of moral degeneracy, and they try to show that by the relief of those conditions of irritation, or impaction, or nerve irritations as results of malocclusions, these individuals have improved very markedly morally, particularly the criminal and the moral degenerates.

Dr. Bisch (closing the discussion). The question has been asked whether impacted teeth can cause criminality. There has not been any definite work, so far as I know, along these lines, and we can only generalize. Any irritation in the system, whether from impacted teeth, or adenoids, or tonsils, will make an individual more or less unstable and irritable. He will "fly off the handle," to use a vulgarism, very easily. But it seems to me that the average normal individual, although irritable and apt to lose his temper, will not actually and deliberately commit a crime merely in consequence of such irritation and nothing else. Some so-called "moral defectives" measure normally, according to our intellectual tests. Yet there seems to be at least deficiency in judgment in most of the cases. It pays to be good and decent; it does not pay to commit crime, and be put in jail for three-fourths of one's life. These people who are continually committing crimes have certainly not learned that it pays to be good, and that is certainly a judgment error.

A person suffering from continuous physical irritation would be more apt to strike if annoyed, yet I do not see why he should commit a murder because of such irritation. If he were normal, there would be enough judgment to curb his irritability, his moral sense being developed enough to hold him in check. If he does commit a crime, and we find he has impacted teeth, we are apt to say, "Here is the cause!" Only by finding out how many impacted teeth sufferers there are who break the laws, and how many there are who do not, could we determine the rôle that impacted teeth play as a causative factor in the commission of crime.

Dr. Ferris. In behalf of the society, I thank the essayist for his efforts. We were greatly enlightened by his being with us.

The society then adjourned.

Academy of Stomatology of Philadelphia.

Regular Monthly Meeting, held February 27, 1917.

THE regular monthly meeting of the Academy of Stomatology of Philadelphia was called to order on Tuesday evening, February 27, 1917, at 8 o'clock, by the president, Dr. E. R. Sausser.

Dr. Sausser introduced as the speaker of the evening Dr. EDWIN SHOEMAKER, Philadelphia, who read a paper entitled "Apical Toxic Focus in General Infection."

[This paper is printed in full at page 502 of the present issue of the COSMOS.]

DISCUSSION.

Willis F. Manges, M.D. It is a pleasure and a privilege for me to come and be with you to speak on a subject with which, while it is not strictly in my line, I daily have a great deal to do. This question of focal infection is one that interests the physician probably more directly than it does the dentist. I say that, because it has not heretofore bothered the dental surgeon quite so much as the physician. The fact that so many of these infections may be in the mouth without producing local symptoms has not made them so marked a matter of consideration as they have come to be since the days of the X-ray and of more extended research work on the subject of focal infection.

I am entirely in sympathy with those who believe that diseased areas in the mouth, especially those that do not communicate in any way with the surface, are a menace to health. One person may have one such area or he may have a dozen; and a person with a single area may have dire symptoms as the result of that one, while another with ten such foci may go on for years and apparently not be greatly disturbed by them. But something is liable to happen, such as a period of overwork or worry (because mental fatigue has quite an influence) when these areas in which there is a lack of vitality—it is not a question of *lowered* vitality, but of *lack* of vitality; there is something that is not nourished—undergo some definite reaction, and then, perhaps for the first time, there will be definite symptoms as the result. A great many of these general conditions are so insidious in their onset—I refer particularly to arthritis—that one does not ascribe them to any cause; but foci in the mouth, I am sure, play a great and important part.

I shall try to discuss the paper as it was read. The question of interpreting what the X-ray shows has been much discussed and written about. In every article read before dental or medical societies, the question has come up whether the dentist or the physician should be the one to interpret the radiographic findings. What is the argument? There is none. If the roentgenologist studies dental pathology, there is no reason why he should not be capable of interpreting abnormal shadows in the X-ray film. On the other hand, the dental surgeon, unless he studies the physical properties of the X-ray and develops a technique that is as nearly faultless as possible, will find that the materials with which he works do not make it possible for him to interpret the conditions present.

I should be much better qualified to discuss a paper along such lines, or to speak of some finer points in differential diagnosis by means of the radiograph, but as that is not a part of the paper I shall not go into it. I wish to mention a case, and with it to emphasize several points, if I may. The case I have in mind is one of exophthalmic goiter—a condition that almost always yields to X-ray treatment; the symptoms all disappear to a certain extent—the rapidity of the pulse, the nervousness, and very often the exophthalmos as well. This case, however, did not respond to treatment, and I supposed that there must be some cause for it. I made films of all the teeth, and found a definite defect, which it pleases me to call an apical abscess. I do not care what you call it, but I believe that I am not making a mistake when I call it an abscess; it remains an abscess until it is evacuated. I had this tooth extracted, not merely amputated, because the girl was already in bad shape. I reasoned that if this tooth was the cause of keeping up her severe symptoms, she would be better off without it. She had perfectly sound teeth with the exception of this one. Within two weeks after the removal of the tooth her pulse-rate went down from 110 to the 80's, more rapidly than it ever does from X-ray treatment alone.

I enjoyed seeing Dr. Shoemaker's slides and listening to his paper very much. He has shown us some beautiful X-ray work, and any man who is in the practice of dentistry and can show you such films must have acquired such a knowledge of the technical side of X-ray work as to be thoroughly competent to interpret the pathological conditions.

[In answer to a question by one of the members as to why he called these condition abscesses, Dr. Manges continued:]

I mean, that if you will open into such an area where there is a cavity that is not a cyst, it may be filled with granulation tissue or pus; but whether one or the other, if you will culture the contents under proper conditions, you will find micro-organisms present. Nature abhors a cavity in bone; you can put that down as a rule. It wants a smooth surface; it wants bone covered with a membrane, and not exposed. At one time all these defects were definite abscesses; that is, they were areas that had been destroyed by bacterial growth. I do not believe that is contested, and at least that is my belief. Now, then, so long as there remains a cavity in the bone, a lack of continuity of bone structure that has once been an infected area, it always remains an infected area, unless it has had drainage and has filled up with healthy granulation tissue—and then it is no longer a cavity. There have been bone salts deposited. I have no doubt that in the majority, if not all, of the less extensive apical abscesses, if you were to institute sufficient drainage through the root-canal and persist in it long enough, you would get that bone area to fill in. It would not stay filled in, however, and for this reason—(I have studied dental pathology some, and shall have to have recourse to it): When there is a cavity and a portion of the root projects into it, it means that the root is denuded of peridental membrane. That membrane has received its life from bloodvessels entering at the apex and those entering upon the alveolar border, but if you destroy both the alveolar attachment and the bloodvessels going in from the apex, you destroy the sources of nourishment entirely. When that happens it exposes the layer of cementum, which is tissue that has no blood supply, no nerve supply, and no lymphatic supply; there is therefore no way for it to repair itself. In addition, it is spongy and roughened, and resists sterilization by ordinary drainage.

Dr. J. Howard Gaskill. Dr. Shoemaker has brought this subject before the Academy in a very interesting way, but it seems to me that there is another side to the question of the effects of apical irritations. I was interested in an article by Dr. Percy Howe, published in the *Journal of the Allied Dental Societies,* September 1916, in which he reviews the work of investigators of systemic conditions arising from septic areas—particularly arthritis and myocarditis—and finds that there is a great difference of opinion as to the cause of arthritis, various investigators claiming that it may be due to infection with one form of organism, and others with another. In fact, one German investigator claims to have produced a form of arthritis by ligating the vascular system in the region of a joint and at that point producing a form of arthritis. With regard to the diagnosis of arthritis and its causes, I read in Dr. Tyson's "Practice of Medicine" the following: "Heredity may play an unimportant part. Shock, worry, and grief have a close relation." Now, the case of Dr. Shoemaker's was attended with a great deal of worry, caused by overwork and the illness of a sister. May it not have been infection from the system rather than of dental origin?

The system may reflect the condition of the whole intestinal tract. The feces are composed of forty per cent. or more by weight of bacteria. The function of membranes of the intestine is to absorb and take up nutrition from their contents. If the intestinal digestion is not normal there is a certain pathological sequel which would naturally follow, and there are conditions that one can readily recognize when there is disturbance in the intestinal tract. It occurs to me that the teeth may be more of an index of pathological systemic conditions than is at present suspected; the tongue and the gums are, and does it not seem possible that the teeth may be also?

There is an interesting article in the *Journal of the American Medical Association* for December 1916 by Drs. Detweiler and Robinson, in which they report cases of myocarditis produced artifically in the lower animals by means of streptococcus viridans taken from both normal and diseased mouths. The atmosphere contains streptococci viridans, so that there is a possibility of breathing them in at any time.

Dr. Shoemaker cited a case of toxic iritis. DeSchweinitz speaks of toxic iritis as a recurrent disease. I wish Dr. Shoemaker would keep in touch with the cases he reported tonight and follow them up to see whether in a year or two there is a recurrence or whether the focus has been entirely removed. DeSchweinitz particularly speaks of these forms as being of a recurrent character, especially if there is any rheumatic history connected with them.

There have been several extremely interesting cases in my practice, showing the reverse side to that stated by Dr. Shoemaker.

In one case a married woman of forty or fifty has had a most remarkable case of arthritis deformans. She is practically helpless, with no motion at the hips or knees, and her arms are getting so that she can hardly feed herself. I was asked whether the condition could be due to dental infection. I looked up my records and found that in twenty-five years I had not extracted a tooth pulp nor had she had any root-canals filled. Radiographs were taken and no sign of infection could be found in any part of her mouth.

Another case is that of a woman, fifty to sixty, who, when about four years of age, took cold while convalescing from scarlet fever. An inflammation was set up at the temporo-mandibular articulation, and her lower jaw became immovable. Her teeth are in a deplorable condition. She had to have the two centrals extracted so that she could take food. There is an infected pocket around every tooth, yet she is free from arthritis or any systemic condition that might be said to be caused by mouth infections.

There is one other case that I should like to cite: About 1890 a patient came to me who had had good dentistry, but there was some other work needed. Shortly the teeth began to decay so rapidly that I could not save them. Her mouth was so dry that it was difficult for her to get her lips down over her teeth. There was not enough saliva to moisten the food, so that swallowing was difficult. Within three years her teeth were all lost, and for some years following that there was a general loss of health. Today she is bedridden with rheumatism. She has not had a tooth of her own since 1893.

Why is it that some people who have worn artificial dentures for years are now just beginning to show evidences of infection? It seems to me that there is a good deal to be done yet before we can extract teeth with the expectation of giving relief to the patients. The cases that Dr. Shoemaker recited tonight seem almost conclusive, but there are many cases that are marvelous coincidences in that after delay they respond suddenly to treatment, and in those cited by the essayist it may be the same. There are many mouths in which there have been extractions with no result; for that reason it seems to me that we should be pretty sure of our diagnosis and our prognosis before resorting to such a disastrous thing as the loss of certain teeth that may be of inestimable value to our patients. I do not wish it to be understood that I never extract. I am extracting more teeth than I did, not trying to save so many as formerly, because I feel there is a possibility that they may be doing harm. I am not willing, however, to accept without reserve the statements of the medical profession which throw so much of the responsibility on dental work.

Dr. W. A. Jaquette. The material I have to present this evening is not of sufficient importance to be offered in the form of an essay; it is simply a report of three cases that I shall be glad to offer in the form of a discussion of Dr. Shoemaker's paper.

At a time when the dental profession is divided, with on the one hand the extremists, who believe the old methods of canal treatment to be good enough, and those on the other hand who are extracting all pulpless teeth—I repeat, at such a time any contribution that helps to clarify the situation is justified, no matter how small it may be.

Case 1. A young girl, age fifteen, in 1905 had the pulp of an upper left lateral die under a filling. An abscess ensued without fistula, and nearly all the symptoms cleared up after treatment. The drugs used were probably essential oils and carbolic acid.

On March 26, 1914, I removed the old root-canal filling and re-treated the tooth. The slight tenderness that had been noticed seemed to disappear and only occasionally returned, when there would be a soreness or uneasiness in the tooth.

In September 1915 an X-ray examination revealed a periapical abscess on the distal side of the root near the apex. On June 9, 1916, the root-end was amputated and the periapical space curetted. On November 15, 1916, Dr. W. Stirling Hewitt and I attempted to make a culture. The Weston A. Price technique was followed; the sterile needle of a pipet was inserted to the end of the canal through the crown, and sealed by melting paraffin about it in the cavity. In aspirating material from the area the pressure used may have been sufficient to make the seal imperfect; at any rate, the test was negative.

At the same time a sterile broach was passed through the canal into the tissues beyond and a stab made in culture media. This also was negative. On November 29th another attempt was made to aspirate material from this canal. This time a different type of pipet was used. After the needle was sealed, Dr. Hewitt applied as much suction as he could, but again the report was negative, as was also the test of a moist cotton dressing that had been placed dry into the canal at the preceding visit. The conclusion here reached is that root amputation does clear up the infection, because cultures made from the amputated apex showed hemolytic streptococcus and staphylococcus aureus.

Case 2. The case of Mr. E. is interesting in its bacteriological findings. He was first visited in the hospital on November 8, 1916. The condition was diagnosed by the physicians in consultation on the case as suppurative endocarditis. As the only therapeutic measure possible in this case was an antogenous vaccine, and the chances of recovery were so slight, it was absolutely imperative that an uncontaminated culture from the original focus be obtained.

The tonsils and sinuses were not involved, and roentgenograms revealed three foci at the apices of teeth roots, and I was asked to obtain a culture from the root of the lower left first bicuspid.

A bridge was attached, but the rubber

dam was adjusted, and though the patient was prone in bed, the canal was opened through to the apex. A sterile broach was used, and a culture made of the streptococcus-pneumococcus group.

This was plated on several different media, but did not grow very luxuriantly, so on November 14th the former procedure was repeated on the upper left second bicuspid, and again the examination revealed the same organisms. This is of particular interest.

Rosenow found that 84 per cent. of his rabbits inoculated with streptococci from endocarditis showed lesions at autopsy, as compared with 14 per cent. of rabbits inoculated with strains from other sources. The apparent affinity of these streptococci—which he considers to be modified pneumococci—for the heart valves, Rosenow believes, is related to their ability to produce clumps in liquid and adherent colonies on solid media; for he finds that endocarditis in rabbits is primarily an embolic process, the organisms lodging within capillaries in the valves and producing first a hemorrhage, later inflammatory infiltration, ending in ulceration and the development of vegetations.

Case 3. The case of Dr. D., age thirty-six, is perhaps of the greatest significance to dentistry and to medicine as well.

In January 1916 the patient noticed the small joints of the hands and feet becoming painful. A search of the body for a focus of infection revealed an abscess about the apex of the root of the upper right first bicuspid and one on the lower right third molar. It is interesting here to note that the X-ray did not reveal this latter abscess. After it was discovered, additional films still failed to show the point of infection. The anterior root of the third molar had been perforated, so this tooth was extracted, as there was also a connection with a pyorrhea pocket.

The abscess in the upper bicuspid produced no objective symptoms, and was discovered by altered tone on percussion. There was slight looseness and some tenderness above the root-end on pressure, and it was also shown by the X-ray. The treatment of this tooth gave every promise of success, as the joint symptoms entirely disappeared by February 24th, as did the tenderness. Repeated X-ray studies showed a lessened rarefaction.

In September 1916 it was noticed that over the apex of the root of the bicuspid slight soreness was felt on deep pressure. Within a few weeks an acute cholecystitis developed. The tooth was extracted and the alveolar process was found to be diseased. The tooth had a very fetid odor. The streptococcus viridans was obtained from the apex. The cholecystitis has disappeared, with no recurrence.

The thoughtless will say that proof is wanting of actual relation of dental focal infection to constitutional disease, but the general relation of the organisms to infection is accepted. When we realize that a dental focus may infect the tissue with micro-organisms to some depth, it is as unwise to consider it lightly and ignore this portal of entry as it would be to leave one of the main doors of the house unfastened when attempting to lock out the burglar.

Case 4. Mr. W. consulted an ophthalmologist in May 1915, suffering from a weakness of the left eye and paresthesia of the left side of the face. He was referred to me, and the usual examination revealed nothing but slight gingivitis. Roentgenograms revealed nothing of note in the maxillæ, but upon a lower molar that had been crowned for fifteen years, and which was entirely comfortable, was found a blind abscess, which was draining into the inferior dental canal. The tooth was extracted and incidentally cut to show canal fillings—whereupon a drill and two broaches were found in the canals!

The symptoms gradually lessened, and I was told this week by the physician in charge of the case that they had entirely disappeared.

Dr. Shoemaker (closing the discussion). The support of Dr. Manges, the medical representative in the discussion, was very gratifying. From one of his broad experience such favorable criticism is most encouraging.

I desire, however, to raise a question as to Dr. Manges' definition of the condition we are now dealing with as "abscess." The quiescent, painless, chronic area of necrotic bone at the apex of a tooth root without free formation of pus, since there is no fistulous outlet, does not coincide with the condition we usually associate with the term. There would seem to be little in common between them. As yet we have no name that appears to satisfy more than a very few observers. Consequently it has many names, apical area, rarefied area, apical osteitis, granuloma, etc.

The suggestion was made of attempting a cure by drainage through the root-canals. This would be a comparatively simple technique, of course, but could have no permanent effect on the condition. There would remain two foreign bodies, the root apex and the necrotic tissue around it, both of which, being infected, would simply remain so. Mechanical removal of these foreign bodies would seem to be the only logical procedure.

Dr. Gaskill suggested that these areas are possibly manifestations of intestinal infection, and are secondary rather than primary. It would be difficult to understand the marked influence exerted on the general infection by the extirpation of the area at the tooth apex if the infection were secondary.

Dr. Gaskill described a number of cases in which the patients' mouths were locally in a shockingly diseased condition, and yet there appeared no general infection; and still others with unusually good mouths, suffering with extremely bad rheumatic and neuritic disorders. These extremes have been observed by all of us, but they do not affect the value and significance of the few cases in which the apical toxic focus has been definitely connected with the general infection. Naturally, we do not assume that all these areas cause disease, nor that all rheumatic and other infections must have a dental origin; it would seem, indeed, that there are comparatively few that do. The main point to be realized is that those few are important, and danger from them must be guarded against by an early diagnosis of the condition.

Dr. Manges. I am sorry that I said what I did about getting at the abscess cavity through the root-canal. I did not mean to have you infer that that is something I would recommend. I mentioned this only to show why I believed these cavities were infected areas.

The society then adjourned.

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

EDWARD C. KIRK, D.D.S., Sc.D., LL.D.

PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, MAY 1917.

EDITORIAL DEPARTMENT

Preparedness — Mobilization — Efficiency.

THE fundamental principle of high efficiency in the mobilization of the dental profession for national defense is the organization of our resources in such a way that the specialized abilities of the whole dental *personnel* may in all cases be most effectively utilized by the national government.

Dentistry, in the present emergency, is potentially able to render a service of inestimable value in conserving within the limits of its field of activity the health and efficiency of those actively engaged in the national defense. This service includes not only the maintenance of oral hygienic conditions in those actively employed in the military and naval service, but also the additional and important work of repair of those who have been incapacitated by wounds and injuries involving the mouth and jaws. The national government has recognized the indispensable character of the service which dentistry can perform—and has, in a large degree, been performing—in these health relationships, by the creation of a corps of dental surgeons in the army and in the navy, requiring the services of a dental surgeon for every one thousand enlisted men.

Under existing war conditions, with the prospect of immediate increase in the army and navy, possibly amounting to two millions of enlisted men, the demand for a corresponding increase in the number of dental surgeons in the army and navy is imminent. In recognition of this need, and for the correlative need of mobilizing the entire dental resources of the country, plans have already been formulated, and are undergoing final organization, to enlist the following organized dental professional agencies in the work of organizing and mobilizing the dental resources of the country: (*a*) The National Dental Association. (*b*) The several state dental societies. (*c*) The local dental societies. (*d*) The classes about to graduate from dental colleges throughout the country. (*e*) The Preparedness League of American Dentists.

Inasmuch as it is important that those contemplating enlistment in the Dental Reserve Corps should be efficiently trained for the practice of their specialty in the army and navy under war conditions, it is important that courses of instruction should be established in dental educational institutions whereby prospective or recently enlisted dental surgeons may be instructed in the army and navy regulations and procedures applicable to their grade and activities, so that they may functionate intelligently and harmoniously with the work of the line, and of the administration and supply departments, and further that they may be trained in the later technical procedures of their profession that have so abundantly developed out of the hospital and field experiences of the present European war. A curriculum for this specialized training has been prepared and submitted to the Surgeons-general of the army and navy, and has received their official approval. This curriculum will be shortly submitted to the dental educational institutions throughout the country, so that they may offer instruction to those contemplating admission to the Dental Surgeons Corps in the army and navy. The physical and intellectual resources of the dental educational institutions throughout the country should be placed unreservedly at the disposal of the government, particularly their clinical and hospital facilities for oral hygiene and dental restorations, in harmony with the purposes and activities of the Preparedness League of American Dentists.

Members of the dental profession, wherever possible to do so, should use their influence to the end that the surgical departments of all hospitals which may be mobilized as base hospital Red Cross units make suitable provision for the treatment of head and jaw wounds by the placing of competent dental surgeons upon the staff, as required by government regulation, and that every hospital have an adequate dental laboratory equipment, so that the highly specialized prosthetic appliances, splints, etc., which must be designed and specially made in every case of restorative treatment of wounds of the jaws involving fracture, or more or less extensive loss of tissue, may be constructed or applied by the dental staff.

The organization of dental resources collateral to those embraced by the professional side should include a survey of the resources of the nation with respect to dental supplies and materials, so that no deficiency may arise which would lead to disastrous delays in outfitting the large corps of dental surgeons necessary under the increased size of the army and navy. It is superfluous to appeal to the patriotism of the dental profession; that is already abundantly manifest. Every indication points to the conclusion that American dentistry is anxiously awaiting the opportunity to serve the national cause, and that only effective organization and direction is needed to give practical expression to the patriotic sentiment which now characterizes the dental profession of America as a whole. The forces of organization are actively at work, and by the time this issue reaches our readers they will have been already in effective operation.

Incidentally, as pertinent to the subject, we would call attention to the special notice at page 573 of this issue, relating to the Dental Reserve Corps, and to the Surgeon-general's notice, at page 584, of forthcoming examinations of applicants for service as army dental surgeons.

Correction.—In Dr. FETTE's paper on "Electrolytic Medication," in our March issue—see last few lines of page 268—the decomposition voltage of zinc chlorid is erroneously stated, through the misreading of a correction by the author, as "–120," instead of 2.18. as correctly given just before.—ED.

REVIEW OF CURRENT DENTAL LITERATURE

[*Journal of the American Medical Association*, February 10, 1917.]

Bacterial Findings and Their Relationship to Pyorrhea Alveolaris and Interstitial Gingivitis. By A. W. Lescohier.

This study is an attempt to correlate the facts established by those investigators who have definitely contributed to the bacteriology of the disease. A very satisfactory bibliography of these contributions is included. Perhaps the most valuable of the early studies of the relationship of micro-organisms to the pathology of pyorrheal diseases is that of Goadby. In his first report he appeared to attach considerable importance to the bacillary forms. Later his attention was directed to the coccoid forms. Medalia's results from 115 cases would lead to the conclusion that the pneumococcus is the most important organism to be considered. Hartzell's work points strongly to the importance of the streptococcus in pyorrhea. Approximately three-fourths of the bacterial content of pyorrhea pus pockets is made up of pyogenic cocci of the streptococcus viridans and staphylococcus types, the remaining one-fourth of other organisms.

Lescohier's own observations relative to the frequency of occurrence places streptococci first, staphylococcus next, pneumococci being obtained in only a small percentage of cases.

The scope of this paper does not extend to a consideration of the relationship existing between pyorrhea and systemic diseases.

Considering interstitial gingivitis and pyorrhea alveolaris as phases of the same disease, we generally recognize that bacterial invasion is characteristic of the pus stage, and is not necessarily present in cases of interstitial inflammation without pus. The bacterial studies are based largely on investigation of cases of the purulent type. The occurrence of gingival inflammation, without infection, as the result of trauma, irritation, and constitutional influences during the non-purulent inflammatory stage of the disease is scarcely open to question. On the other hand, the conclusion of some investigators that bacterial invasion in pyorrhea is invariably a secondary factor, infection being universally absent prior to the pustular stage of the disease, does not seem to be established.

The tendency to consider any etiologic factor in pyorrhea as an entity, instead of in its relationship to other influences, is unfortunate. Irritation, trauma, metabolic disturbances, and microbic invasion constitute a vicious circle in the development of alveolar diseases. The bacterial is probably the most important element in the destructive tissue changes, and certainly so in the serious sequelæ. While it is impossible definitely to classify interstitial gingivitis or even pyorrhea as primarily a microbic disease, the pathology is intimately associated with the results of bacterial invasion, and the adequate consideration of its treatment must necessarily recognize the importance of the infectious element.

[*Norsk Tandlaegetidende*, 7. H., 1916.]

The Formation and Structure of Enamel. By Johan Rygge.

The presence or absence and the nature of an interprismatic substance in dental enamel has long been a subject of controversy. In the pages of the Cosmos of recent years have appeared the studies of Pickerill, von Beust, and Mummery, all affirming the presence of this substance. Rygge's study is another contribution to this question. It differs from the earlier work notably in giving attention to developing—*i.e.* still incompletely calcified—as well as to fully formed teeth.

The material which permitted this desirable extension was the mandible of a child of fourteen months. Only the first two incisors had erupted. The other teeth were dissected out of the bone, fixed in alcohol, and immersed *in toto* in a solution of alcoholic diamant-fuchsin for fourteen days. Ground sections were now prepared, in all but the four anterior teeth, by the Koch-Weil petrification method.

The material for the study of the fully formed teeth consisted for the most part of non-carious bicuspids, first and third molars, and the anteriors. The staining method was the same as given above.

From the study of these sections Rygge concludes that in developing teeth the decalcification of the enamel follows the contour bands of Preiswerk. First those contour bands which lie nearest to the dentinal cusps are calcified. Gradually this process extends to the surface along the lines of these contour bands. The coronal cusps are first calcified, then the lateral surfaces, and lastly the enamel at the amelo-cemental junction. The calcific material is supplied through the vessels of the dental sac and from and through the dentin.

In completely developed teeth the enamel may at times be partially stained with fuchsin. The degree of staining is independent of the age of the individual. The areas at the amelo-dentinal junction, which can be stained through the dentin, show clearly after decalcification the prismatic structure, wherefore they are to be considered as parts of prisms which have remained uncalcified, and which lie in one or more of the contour bands. The stain is present as well in a transverse—in the contour bands—as in a longitudinal—in the prism bundles—direction.

In the case of the developing teeth as well as of the fully developed teeth with still uncalcified prismatic parts in the several contour bands, it may be demonstrated by means of fuchsin staining and of decalcifying procedures that the boundary lines between the contour bands are more highly calcified than the bands themselves.

The lamellæ of Boedecker exhibit after decalcification no prismatic structure, but a fine fibrillar tissue. At times intercrossing bridges may be seen from the same tissue between two neighboring lamellæ. Through a lamella, non-calcified prismatic bundles can also be colored, which lie in one or more contour bands.

The calcified cementing—interprismatic—substance is not permeable to stains. Consequently any interchange of tissue juices between dentin and the completely calcified normal enamel is not to be thought of.

[*New York Medical Journal,* March 17, 1917.]

The Saliva of Diabetics. By L. N. Boston and L. W. Kohn.

In diabetes it is well known that we have a metabolic disturbance which interferes with the proper disposition of the carbohydrate food elements, *i.e.* the ability of the organism to safekeep sugar. The inseparable relationship between the diabetic organism and the metabolism of carbohydrate foodstuffs has suggested to the authors a study of the digestive functions in diabetes as a possible means of attaining practical knowledge. This idea applies especially to the salivary glands, since the salivary secretion is the first potent factor to which the carbohydrate food elements are subjected during the process of digestion. For this purpose a study was made of the salivas in twelve cases of clinically true diabetes. Ten normal specimens were examined as a control. A preliminary review of the literature reveals that age and sex have no decided influence on the diastatic action of the saliva. In the experiments the temperature range adhered to was that between 38° and 40° C. It was endeavored to keep the temperature nearer to 38° C. than to 40° C., in order to approximate the so-called body temperature. The reaction of the normal saliva, according to these authors from the experience of these studies, is probably acid in reaction more often than hitherto suspected. The reaction of the saliva in the present series of twelve diabetic patients was given special consideration. In twenty specimens from diabetics only one was found that gave an alkaline reaction; all others were feebly acid in reaction. Ten specimens of saliva from normal persons were also examined, and all of them were found acid. Phenol-phthalein was used as the indicator, and N/100 NaOH or HCl solution for titration for the determination of acidity or alkalinity of the specimens. There is no marked difference in the degree of the reaction of the saliva of normal persons and that of diabetics.

In every instance the saliva was examined for the presence of potassium sulfocyanate

(KSCN). There was a failure of reaction in two specimens; in every other instance a faint or decided reaction occurred. In the two specimens where the reaction was negative it was noted that one specimen was alkaline and the other faintly acid. Such results reveal nothing definite.

Boston and Kohn confined their attention particularly to the diastatic function of the saliva obtained from persons suffering from diabetes mellitus. The method employed, which is given rather fully in the text, was a slight modification of that of Wohlgemuth. The temperature, as already stated, was close to 38° C. The soluble starch of Kingsford was used. Previous studies have given wide ranges for normal diastatic activity, from 160 to 780. In the ten normal specimens examined in this study the high points of diastatic power varied from 50 to 200. In the twenty specimens from diabetic patients the diastatic power varied from 75 to 500. It also varied considerably in the same individual on different days; there seemed to be no uniformity of action in any particular case. On the whole, the diastatic power seemed to incline toward a higher level in the diabetic cases than in the normal cases. The height in the diastatic power in almost every instance fell within the wide limits established by preceding workers on the normal man.

Boston and Kohn summarize this work as follows:

(1) The saliva is often more acid in reaction than has hitherto been reported, and probably is acid in more instances than it is either alkaline or neutral.

(2) A minimal acidity probably does favor diastatic activity, but the degree of minimal acidity has no special bearing, so long as it is not too high, *i.e.* approximately 0.03 per cent. Diastatic activity varies within wide limits in normal as well as in pathological cases. In diabetes the diastatic activity varies within wide limits. Salivary power was slightly higher in this condition than in our normal control cases, but we are not inclined to believe that this is a constant feature. Further experimentation will be necessary to show the constant diastatic activity of the saliva for normal adults. We can trace no definite relationship between the diastatic energy of the saliva and the quantity of sugar in the urine. The normal specimens of saliva all had about the same degree of acidity, ranging from 0.0146 per cent. to 0.0219 per cent. Excepting one specimen which was alkaline in reaction, all the others exhibited acidities ranging from 0.00365 per cent. up to 0.07665 per cent.; therefore quite a number showed acidities higher than 0.03 per cent., the limit where diastatic activity is supposed to be retarded, and yet the diastatic activity sustained itself quite well.

This report represents much work. Its interest to the dental profession lies not alone in its being primarily a contribution to our knowledge of the saliva, but also on account of the relationships existing between oral conditions, *e.g.* caries and pyorrhea alveolaris, and diabetes.

[*Medical Record*, December 30, 1916.]

Diathermia in the Treatment of Trifacial Neuralgia. By H. F. Wolf.

Diathermia is the heating of tissues by means of the high-frequency current. It seems advisable to employ it before other methods are tried, such as alcoholic injections or the resection of the Gasserian ganglion. Wolf prefers to apply the electrodes in such a way as to have the ganglion between them. This is secured by placing one at the back of the neck and the other over the eye, protected by cotton saturated with saline solution. Usually 700 milliampères are given, and each treatment lasts from one-half to one hour.

[*American Journal of Medical Sciences*,
Philadelphia, February 1917.]

Vincent's Angina. By Andrew T. McClintock.

The organisms to which is assigned the rôle of causative agent in this disease are the well-known fusiform bacillus and the spirochete of Vincent. McClintock once obtained from the peritoneal cavity of a sputum-injected mouse a smear which was typical for the average throat, and included Vincent's organisms.

In 100 individuals having healthy throats, smears were made. In 43 per cent. Vincent's organisms were demonstrated.

In the twelve cases on which this article is based, smears stained with gentian violet were used in all; in three cases the dark-ground illuminator was used. The necrotic tissue as far as possible was used exclusively for the smear. In one case an emulsion of this was injected into a mouse, without result. Of these twelve cases, four were individuals from whom smears had been previously taken in the study of healthy throats. Of these, two showed Vincent's organisms when in a healthy condition, and later suffered from a disease apparently due to these organisms. One showed it previously, but a later sore throat was streptococcic; and one having a smear negative for Vincent's previously, later developed Vincent's follicular tonsillitis.

[*Journal of Experimental Medicine*, Baltimore, February 1, 1917.]

The Cultivation of Trichomonas of the Human Mouth (Tetratrichomonas Hominis). By T. Ohira and H. Noguchi.

The material for this study was afforded by the tartar of the mouth. Among the many culture media that were tried out, the mixture of ascitic fluid and Ringer's solution in equal parts and in its natural alkalinity gave entire satisfaction. By placing the tubes inoculated with dental tartar at 37° C. and then transferring a small quantity from the bottom sediment into a new medium every twenty-four hours for four or five days in succession the number of organisms gradually increases, and no difficulty was experienced in finding quantities of agglomerating flagellates as well as free individuals in every field. In this way strains were carried for over twenty generations.

Endamœba gingivalis in this medium can easily be kept alive over twenty-four hours. In some instances the amœbæ were kept alive for as long as ten days. It is likely that the amœbæ multiply, though not as strikingly as do the trichomonades.

The body of the trichomonas is uniformly pear-shaped, but highly flexible. The protrusion of any definite pseudopodium has not been seen, but a prolongation of the protoplasm near the posterior end was often observed, frequently used as an anchor. The presence of a cytostome is probable. The average size is 10 to 15 micra by 4 to 8 micra. The flagella at the anterior end are always four in number, averaging 14 to 16 micra in length. An undulating membrane is distinctly visible. The axostyle usually seems to take origin at the distal end of the nucleus. Distad the axostyle may project beyond the margin of the posterior end of the organism, forming a free tail, 5 micra or less in length. The nucleus is single, oval, more or less elongated, has a distinct karyosome, and measures 1–1.5 micra by 2 to 3 micra. The cytoplasm shows no differentiation into ecto- and endoplasm, no contractile vacuole, or chromidial apparatus. Reproduction is ordinarily a binary, longitudinal fission; multiple fission (budding) into 4, 6, 8, etc.; daughter-cells may also occur. No cyst forms were recognizable.

[*International Journal of Orthodontia*, St. Louis, December 1916.]

Effective Localization of the Streptococcus from a Case of Pulpitis, Dental Neuritis and Myositis. By E. C. Rosenow.

This paper records the history of a case with the purpose of adducing experimental evidence upon the causal relationship between oral infectious foci and systemic disease.

The case is that of a married woman, age thirty-five years, subject to severe migraine for many years, recurring attacks of facial neuralgia, ending in spasm of the muscles, and tenderness and swelling of the neck on the left side. Physical examination of the most intense character revealed nothing pertinent. However, owing to the fact that each attack began with swelling of the left upper jaw opposite an upper left first molar, this tooth was extracted. An eroded area upon and pus in the palatal root were found. Ascites-dextrose agar and broth gave a pure culture of a slightly hemolyzing streptococcus. Improvement followed the extraction.

The streptococcus was also demonstrated in sections and isolated from the infiltrated deep fascia and muscles of the left side of the neck. A similar streptococcus was isolated from the pharynx and stools. By animal experimentation this streptococcus was proved to have elective affinity for the pulp of teeth, dental nerves, and muscles. This affinity was proved absent in the diphtheroid bacillus and B. fusiformis, which were also isolated from the pulp of the tooth, and in streptococcus broth culture filtrate.

These results would appear to warrant drawing the conclusion that the attacks of facial pain in this patient were due to a streptococcus infection of the sheaths of the dental nerves, and that the pain, swelling, tenderness, and spasm of the muscles of the neck were due to myositis and fibrositis, the result of infection by this streptococcus. The demonstration of living streptococci in the pulp of the tooth and in the fascia and muscle during quiescent periods is significant, and may explain the recurrence of attacks.

The improvement in the patient since extraction of the tooth appears to be due to the removal of the focus, and to prolonged artificial stimulation of the defensive mechanism by means of the autogenous vaccine. However, the isolation of this streptococcus from so many places indicates that complete recovery will probably be difficult.

[*Journal of the American Medical Association*, February 10, 1917.]

The Roentgen Ray in the Diagnosis of Pyorrhea. By H. E. Potter.

Roentgenography for the demonstration of pyorrhea alveolaris does not differ in its technical plan from that used in other procedures intended to shed light on disease located in the jaw-bones.

The rough delineation of the general present depth of the alveolar process with respect to the dental roots in a case of known pyorrhea is therefore a relatively simple problem. But in any series of pyorrhea cases, the general roentgenographic survey is capable of bringing to light some of the minor changes about the roots of individual teeth, *e.g.* localized or beginning extension of the disease toward a given apex, the softening of the adjacent alveolar wall due to an early inflammation of a single periodontal ligament—the signs, in short, of the early and deeper encroachments of the disease which are so important in the complete diagnosis and prognosis of a pyorrhea case. For the detection of these minor but most important changes in the bony investments of the teeth only the most critical roentgenography is of value.

To obtain the most valuable average line—of marginal alveolar bone—as a gross measure of the ulcerative process, roentgenograms may be made at a considerably lower angle than for the demonstration of apices, although an elongation of the dental shadows will result.

A very delicate partial decalcification of the linea dura to and around the apex, together with a slight widening of the space occupied by the periodontal ligament, is the premonitory sign of the inflammation of the ligament, which precedes extension of the funnel-shaped pocket to and around the apex.

Potter very clearly emphasizes the shortcomings of the radiograph. By itself it may be worse than of no value—it may be actually misleading; and only when used as a supplement to and not as a substitute for other diagnostic methods does it find its just and greatest usefulness.

[*Dental Digest*, March 1917.]

Gum Blocks for Partial Dentures. By Walter M. Bartlett.

The large number of cases calling for partial dentures of various types constitutes one of the most serious problems for the dentist with a sense of esthetics. The following method is a modification of continuous-gum technique, greatly simplified and comparatively easy. The case is set up in the articulator as usual; proper platinum pin teeth are selected and arranged. Remove the teeth and all the wax from the cast, outline the limit of the proposed restoration, and burnish platinum foil over the area to be occupied by the porcelain. The foil is waxed to the cast lightly, and wax is adapted over the portion to be covered by the porcelain gum. Reset the teeth only by their necks—avoid getting wax on the pins. Build up the wax as desired. Remove the assembled piece, invest in 2 parts tenax and 1 plaster, pins down. Scald out the wax, dry carefully, and fill in with continuous-gum body between the teeth and foil. Contour properly this gum body, dry, and fuse. In simple cases, contraction is so slight that the addition of the gum enamel compensates for it. If this compensation would be unsatisfactory, make a second application of the body. After cooling, peel off the foil and smooth the edges of the porcelain.

This method, besides being esthetically desirable, offers the advantages of a selection and arrangement of individual teeth and their anatomical articulation. It does not require unusual skill, and is applicable to removable bridge work as well as to partial vulcanite dentures. Doubtless in many cases where there has been a loss of alveolar process and gum tissue by resorption, this method will recommend itself.

[*Paris Médical*, January 20, 1917.]

A Little-known Sign of Fracture of the Mandible. By L. Imbert and L. Gautier.

Anesthesia in the distribution of the mental branch of the inferior dental nerve is pathognomonic of mandibular fracture. This is the case whether the fracture involves the body, angle, or lower part of the ascending ramus. The skin of the chin becomes anesthetic in a circular area about 3 cm. in diameter on the side affected. Anesthesia is also found on the internal aspect of the lips, the vestibular portion of the gum as far as the line of fracture, and sometimes also on the lingual surface of the gum. The sign is of considerable diagnostic value, not only because it is constant in recent fractures but because it persists in old fractures. In the latter case it is sometimes the sole remaining evidence of the injury, all objective signs having been removed through early and careful dressing or by surgical intervention. The sign is usually wanting in fractures of the ascending ramus above the foramen of the dental canal, or of the coronoid process or condyle.

[*New York Medical Journal*, March 10, 1917.]

Oral Sepsis: A Note of Warning with Regard to Its Treatment. By J. M. Anders.

This paper was dictated by a desire to spare the medical profession the adverse criticism of the future by a broader conception proper to the subject of oral sepsis in the present. Anders prefaces his remarks with the assurance that he can appreciate the validity of the contention that the oral cavity may harbor foci as a cause of secondary infections. At the same time he recognizes that the tooth-root theory of disease is not yet accepted by some, at least, of the more progressive dentists. The realization of this by the thoughtful general practitioner will make him cautious not to diminish the masticating surface of the patient without reliable scientific evidence of an existing necessity for so doing. Too often the physician issues his order for a wholesale extraction merely on the basis of an X-ray examination—by amateurs in many instances. It is much the better practice to refer all cases of suspected oral sepsis to a competent dentist.

Perhaps the needless and ruthless sacrifice of teeth has been greatest in patients suffering from arthritis deformans. Quoting Dr. Gaskill in this connection, Anders says that several such cases recently were observed where all the teeth have been extracted, and where it not only failed to help the arthritis, but actually made the condition worse.

Anders insists that in all cases of suspected oral foci the physician and the dentist must work together to secure the best results. All foci of infection other than those in the mouth (tonsils, sinuses, etc.) must be eliminated by a process of exclusion. In such cases the advice of a competent rhinologist and laryngologist is invaluable.

The sanity and conservativeness, all too rare in current medical thought, of Anders' views are emphasized in his concluding remark: It is a false and dangerous doctrine that helps a physician either to ignore or undervalue the importance of normal masticating power.

[*Journal of the Allied Dental Societies*, New York City, March 1917.]

Ionic Medication, with Special Reference to the Treatment of Granuloma and Pyorrhea. By Ernest Sturridge.

It is difficult to realize that this article and that of Prinz in the April Cosmos treat of the same subject. The rationale of this method is succinctly stated as follows: "The advantage obtained by ionic medication in the use of ions over the ordinary osmotic methods is that it is possible to concentrate and drive the medicine into the tissues where, in its passage, it acts on an area below the surface which is not reached when a wash is used to irrigate or bathe the surface."

Some of the principal and best known ions used therapeutically are, under the antiseptic group, zinc, copper, mercury, silver, and iodin, ions, all effective and useful for the treatment of gingivitis, pyorrhea, chronic alveolar abscesses, granuloma, fistulous tracts, septic root-canals, epulis, stomatitis, etc.; under the anesthetic group, cocain, novocain, and allied alkaloids, useful for hypersensitive dentin, pulp, gum tissue, and mucosæ—adrenalin may be added for hemostatic effect; under miscellaneous groups, argyrol, useful in stomatitis, salicylic and quinin ions, advocated for trigeminal and occipital neuralgia. The most striking effects of ionization are to be seen in the treatment of granuloma and pyorrhea, and consequently Sturridge outlines his form of treating these conditions.

He advises the use of a 3 per cent. solution of zinc chlorid ($ZnCl_2$) and a platinum or zinc point at the positive pole—that is, in the root-canal. The zinc cations are repelled from this positive pole, and tend to migrate *through* the tissues to the cathode. It is in the initiation of this migration that their therapeutic action is accomplished. The strength of the current approximates roughly that advised by Prinz (about 5 M.A.). The length of application is not given, but "The granuloma is ionized two or three times at intervals of a few days," and then the root-canal is filled by Rhein's method of protruding gutta-percha points. Prinz ascribes the beneficial result of this method to the concentration of chlorin anions in the apical and peri-radicular regions.

Sturridge is satisfied that pyorrhea can be cured by ionic medication with methodical attention to many diagnostic details, which are just as important as the treatment. Ionization is adequate to deal with the bacterial phase of the disease. "Perfect instrumentation" is an absolute prerequisite. Then a small pear-shaped zinc anode, wrapped with a few shreds of cotton and saturated with a 3 per cent. solution of $ZnCl_2$, is passed into the pockets and interspaces of the affected teeth. The patient holds the cathode in his hand. The anode is held steadily at the bottom of the pocket in general for a minute or two (with about 5 M.A.), after which the electrode can be removed, but in perfect contact, to an adjoining pocket. The treatment is repeated three times a week at first, and twice a week later, until all septic symptoms disappear.

A clinical record of a great number of cases assures Sturridge that not only can very bad cases of pyorrhea be cured by the aid of ionization, but that from year to year there is to be noted a steady improvement in the general condition of the mouth, so that the teeth are more comfortable after ten years than the first year or two after the cure had been effected.

[*New York Medical Journal*, March 17, 1917.]

Prevention and Treatment of Cancer Based upon X-ray Findings of Dental Infection and the Use of Autogenous Vaccines. By Sinclair Tousey.

In a few introductory remarks Tousey indicates the possibility—apart from the number of immediately exciting causes—of a focus of infection being the underlying cause of cancer. If there is a germ causative of cancer it is manifest that it is of a type that must find a permanent lodgment, as in the teeth. If cancer is due to infection the teeth afford by all means the most favorable nidus. Tousey's own observations show severe dental infection in all cancer patients so far examined. A patient with cancer should have the teeth radiographed so as to discover and eradicate foci of infection. The micro-organisms in such foci should be studied, with a view to securing an autogenous vaccine, and for the possible discovery of a specific germ for cancer.

Tousey's remarks on the treatment of cancer are interesting. The sooner the dental foci are eradicated the better the chance of success with operation by the knife or electricity, combined with X-ray and radium. An autogenous vaccine will doubtless be indicated in a greater percentage of cancer patients than among the arthritic cases, where the eradication of the dental focus usually overcomes the general infection.

The present article is published for purposes of priority, and to bespeak the coöperation of those interested in cancer research. Tousey as yet is not ready to report upon the results of the eradication of dental septic foci or the administration of an autogenous vaccine in cancer cases. His four cases given in brief are suggestive though by no means conclusive.

This paper recalls an earlier one of essentially identical basic thought, though the latter did not premise the infectious nature of cancer—"Pyorrhea Alveolaris as a Predisposing Cause of Cancer of the Alimentary Canal and Associated Parts," by F. St. John Steadman, published in the Cosmos for July 1914.

PERISCOPE

Sharpening Hypodermic Needles.—A dull or rusty needle is a prolific cause of abscesses. Wipe the needle from time to time with crocus cloth, procurable at hardware or cutlery establishments. Have a good hone, such as the Wachita razor hone. Thrust the needle with the wire in through a bit of soft cork long enough to come within one-quarter inch of the beginning of the bevel of the needle. The cork serves as a handle and also holds the needle stiff. A few light rubs upon the hone put a keen point on the dullest needle.—J. M. H., *Dental Review.*

To Secure Exact Occlusion.—For full sets of teeth, it is often difficult to get the occlusion exact and "flat." Some prosthetists take emery flour and mix with oil. After remounting on the anatomical occluding frame they smear the grinding surfaces with this, then work the sets and gradually wear the occluding surfaces until they close "flat." This is very tedious. Avoid this by smearing upon these surfaces hydrofluoric acid, being careful to use fresh acid, and only a little. Set the case aside for two or three hours. Now smear with emery powder and oil and the surfaces will easily wear down to that very desirable solid and flat occlusion. This also removes the glaze. The teeth will not dance or tip, other things being equal.—E. J. PERRY, *Dental Review.*

Dental Clinics in Large Corporations.—Many of the largest corporations of the country have dental clinics to care for the teeth of employees. Industrial employers recognize that dental dispensaries are needed in factories and department stores, etc., because sickness, absence, or disability necessitates the "breaking in" of new workers. The following are but illustrations from several cities of the widespread interest in dental inspection: The Colorado Fuel & Iron Co., Denver; Lord & Taylor, New York City; John Wanamaker, New York City; R. H. Macy & Co., New York City; Sears, Roebuck & Co., Chicago; Larkin Co., Buffalo; The Armstrong Cork Co., Pittsburgh; Amoskeag Manufacturing Co., Manchester, N. H.; Metropolitan Life Insurance Co. of New York.—RICHARD GRADY, *Oral Health.*

Conditions Calling for Root Amputation.—Where the tortuousness of the root does not permit of its thorough cleansing and sealing, the canal can be filled as far as possible, and the remainder of the root amputated. Where a broach broken at about the apical third of the root-canal prevents its proper treatment, the part containing the foreign body may be amputated after the remainder has been properly cleansed and filled. Where the root has been perforated at about its apical third, this may be amputated at the perforation. Where an individual root of a multi-rooted tooth has lost its peridental membrane and alveolar process through extensive pyorrhea, or through hypertrophy, this may be amputated after the portions to be retained have been adequately disposed of.—A. BERGER, *Dental Items of Interest.*

To Remedy Faulty Contact Points.—To remedy a faulty contact point, filling material may be used. Amalgam limits the possibility of correct restoration because it is not hard enough to withstand the constant rubbing against it of the adjacent tooth without becoming more or less flattened. A gold foil filling, well condensed, is better, yet does not meet the requirements of the case as well as does the gold inlay. As a filling material for securing ideal contact points, the gold inlay is far superior to any other. It should fit as tightly as possible, even though its insertion prove uncomfortable to the patient. If a tightly fitting, or one might say an over-large gold inlay, is placed in an approximal cavity the contact points all along the arch will be tightened. The contact point on the inlay may be made of 18-karat solder, flowed over the 22-karat inlay. This gives the required hardness to withstand abrasion.—*Oral Health.*

Radiographs Not Always Reliable.—The statement that the X-ray proves whether a tooth has been filled properly is open to question even today. We must not forget that some solutions and filling materials do not give shadows in all parts of the canals by this method. It depends on the solidity of the filling cones or the chloro-percha or agent used, and whether metal be used. Unless a sufficient quantity of filling material be present to cast a shadow it is usually not reproduced.

The amount of regenerated tissue in the diseased area after inflammation and abscesses cannot always be estimated, as the connective tissue takes a long time before the periosteum and bone are replaced in it, and all light areas around the roots are not pus, but may be organizing tissue. One of the most difficult problems is to judge the amount of absorption of a root or roots and the possibility that the canals are open at the apices through the filling's being resorbed.—V. A. Latham, *Dental Items of Interest.*

Prophylaxis Necessary Prior to Affixing Appliances.—Orthodontic appliances are frequently placed upon teeth and in mouths in no condition to receive them. This alone is responsible for many cavities which develop during treatment. Roughened enamel surfaces so frequently found on children's teeth are impossible to cleanse with any equipment available to a patient. Is it not reasonable that any appliance placed in a mouth where there are such surfaces present would add to the difficulty of the cleansing process? It has been demonstrated by the method of oral prophylaxis that highly polished enamel is easily cleansed, and that bacterial masses attach themselves with greater difficulty to such a surface than to a roughened one. Therefore it is suggested that whenever feasible the teeth of an orthodontic patient should be carefully and thoroughly polished according to oral prophylaxis standards before a single appliance is placed upon those teeth.—Grace Rogers Spalding, *Dental Items of Interest.*

Tonsillar Infections and Pyorrhea.—Tonsillar infections must also be considered in the examination of pyorrheal conditions, as they may affect the oral mucous membrane by direct proximity, if in no other way; or, again, the tonsils may become infected as a result of the oral condition. The relation of the two is apparent in numerous cases.

Tonsillar infection is practically always secondary to infection in the air-passages or jaws, though the tonsillar trouble may persist long after the cause has disappeared. Thus affections of the teeth and jaws should be added to the vicious circle of infections having their origin in the upper air-passages, as contamination of the oral mucous membrane could take place through direct proximity of broken-down tonsillar structure, and also through direct embolic infection. There is absolutely no reason why infection must travel in one direction and not in another. Tonsillar infections have repeatedly improved after the cleaning of a dirty mouth; also the oral conditions have improved after the removal of septic tonsils.—J. Novitzky, *Pacific Dental Gazette.*

The Gold Inlay.—As compared with amalgam, the gold inlay is superior. (1) Because of its greater edge strength, it is more able to stand masticatory stress without breaking in cases of large contour restorations. (2) Because, unlike amalgam, it keeps the size and shape in the cavity that it had when first inserted; it neither contracts nor expands on hardening, as does amalgam. (3) It is cemented into the cavity, thus forming a physical union with the tooth which it builds up instead of leaving space between the surfaces of the filling and the tooth cavity for the fluids of the mouth and probably microorganisms to enter. (4) There is no flow or protrusion of the gold from the cavity as there is in the case of amalgam. (5) There is no tendency to assume a spheroidal form, thus spoiling the cavity margins and frequently inviting secondary caries. (6) It maintains its color, being unaffected by any of the fluids of the mouth, and does not discolor the tooth. (7) And, most important of all, you can restore natural tooth form and contour more exactly with gold than with amalgam.—S. Shapiro, *Dental Outlook.*

Quick Method of Making a Backing for a Steele Posterior.—This may not be new to many, but there are hundreds of dentists in out-of-the-way places who would appreciate knowing how to make a gold backing for a Steele posterior in an emergency, and at one-third the usual expense. In addition you have a practically one-piece boxed-in backing ready in a few moments for soldering.

(1) Insert a wire in the round opening of the Steele posterior facing, slightly smaller than the size of the hole.

(2) With a pair of flat-nose pliers fit a piece of pure gold around the wire, then cut off the flat end of the gold at an angle of about forty-five degrees to the tubular end and fit the pin just made to the tooth. Cut the pin until it protrudes about one-sixteenth of an inch above the porcelain. Fill the tubular end with solder.

(3) Adapt a piece of pure gold to the Steele posterior, burnishing the same into the pin opening of the tooth. Remove, and cut away the part burnished in the opening, force the pin through, remove, and solder. If the pin is made a trifle larger the opening in the pin facing may be enlarged with a suitable stone.—L. Siegal, *Dental Digest.*

X-ray Diagnosis of "Blind" Abscesses.—Unfortunately, it has become among physicians quite a prevalent idea that the diagnosis of "blind" abscess from X-ray films is a very simple matter, and a great many erroneous diagnoses have thereby been made. The darkened areas which are found in X-ray photographs about the root-ends of teeth may suggest a variety of conditions, and must not empirically be decided upon as abscesses. The very fact that drugs and chemicals which are used in the process of devitalization and in the treatment of root-canals by dentists are frequently strong escharotics and coagulants renders it quite reasonable to suspect, as a consequence, that a great many of these dark shadows are nothing more than coagulated lymph, in the lymph spaces and in the periapical space about the root-end, and frequently, therefore, are not at all expressions of pathological conditions, or "blind" abscess. There are many other conditions that in X-ray pictures very closely simulate blind abscesses; I would therefore caution my medical *confrères* to leave the diagnosis of affections about the root-ends of teeth expressed in X-ray pictures to those who may be better qualified and are more familiar, not only with pictorial expressions, but with the anatomical structure, and the history and symptomatology, however slight the latter may be.—H. H. Schuhmann, *Dental Review.*

Objections to Root Amputation.—As with all technical procedures or operations which radically depart from the usual mode of practice, so root amputation has its advocates and opponents. The most plausible objection raised by those opposed to this operation is that the functioning possibilities of the tooth, which are already weakened by the pathological process, are still more impaired by the mutilation entailed by this operation. Others object to it mainly because they have not met with the degree of success which some men claim for it. It is apparent that one of these objections is due to lack of understanding of the histo-pathology of a dento-alveolar abscess, and the other to lack of understanding of the cases in which this operation is indicated or applicable, or to faulty technique. The most frequent cause of failure seems to be, however, that a great number of men are regarding this operation as an abscess cure, which it essentially is not. We must bear in mind that root amputation is an auxiliary measure for the eradication of the pathologically induced tissue proliferations and detritis which result from a protracted suppurative process, and for the surgical removal of such portion of the tooth root as has been rendered permanently useless and the presence of which exerts a baneful effect upon the surrounding tissues; also to prevent infection where the tortuousness or the position of the root does not permit of its proper cleansing and filling.—A. Berger, *Dental Items of Interest.*

Filling Materials for Children's Teeth.—The one great essential in a filling material for young children's teeth is ease of manipulation. With a head continually on the jerk, a tongue with a muscular power of about 40 lb. to the square inch and the energy of a steam-engine, and muscles of the cheeks and lips to match, and with salivary ducts like so many hose flooding the mouth, you have no free hands or time to do fancy work—you want a material that will work with the greatest ease possible; and the one filling that stands out far and away above all others, in my experience, is copper amalgam. It is a great tooth-saver, is ideal to work, and—another important point—suffers least damage of all our materials through moisture getting in—and with very young children you can never be sure that that will not occur. The only objection to it in the back of the mouth is that it wastes away, but this can be avoided by covering it with a harder alloy. Oxyphosphate of copper cement is much advocated in this connection, and I have given it a good trial, but to my mind it is not to be compared with the alloy. For one thing, it washes out worse than the alloy; but more than this, it is about the most difficult of all our materials to manipulate. Its greatest advantage is its adhesiveness—for one great difficulty with deciduous teeth, especially in approximal cavities, is their shallowness and the difficulty of getting retention; but a good way to overcome this is to cut a step in the coronal portion of the tooth as for inlays, only shaped with an undercut.—F. H. Stephens, *Australian Journal of Dentistry.*

Pulp Nodules.—Pulp nodules, while frequently found in apparently healthy teeth, that is, teeth without caries and free from irritating mechanical influences, are much more likely to occur and to grow with greater rapidity and to greater proportions in teeth the pulps of which are under the influence of some external irritant. There is some difference in the character of these growths. In the majority of instances, pulp nodules in otherwise healthy teeth are most apt to be of the floating or unattached variety, while in those cases in which the pulp is under the influence of some surface irritant, the nodular growths are likely to be attached to the walls of the pulp chamber. I believe it is a well-understood fact that only in a small proportion of cases are the unattached nodules a cause of pain, and this is especially true if they occupy the central portion of the pulp chamber. The reason for this is explained by the statement that they represent the actual calcification of just so much pulp substance, and as such, cause little or no pressure on the surrounding parts. On the other hand, the nodular deposits attached to the pulp chamber wall are more likely to cause pain because of their close association and possible pressure upon the capillary loops and nerve terminals so much in evidence in this part of the pulp. In the former case, the floating pulp stone is not an odontoblastic product, while in the latter it is very likely to be. The foregoing is therefore another argument in favor of discriminate pulp removal when the crown of a tooth is to have added to it a mechanically irritating substance.—I. N. Broomell, *Dental Items of Interest*.

Effect of Ionization in Pyorrhea.—Ionic medication in pyorrhea treatment places at our disposal a means of dealing with the micro-organisms and amœbæ which are no inconsiderable factors in the pathological aspect of the disease. The ordinary osmotic methods of irrigation and syringing and general applications of antiseptics are quite inadequate for reaching bacteria which penetrate below the surface, and even deep into the alveolar bone of the affected parts. These have to be sterilized in order that tissues may repair and take on healthy metabolism. I have seen many cases where perfect instrumentation with ordinary antiseptic treatment has failed to cure consistently because of the lack of this technical detail. These very cases I have watched after ionization from year to year, and have seen them become more and more immune from reinfection and remain perfect cures.

It is a remarkable fact that, at first, while the stirring up of bacteria in the tissues by instrumentation is in progress, the symptom of malaise, so often present, is usually increased, but after a few treatments by ionization this disappears, much to the gratification of the patient.

A clinical record of a great number of cases, extending over a number of years, places me in a position to be able to state that not only can very bad cases of pyorrhea be cured by the aid of ionization, but that from year to year I have noted a steady improvement in the general condition of the mouth, so that the teeth are often more comfortable after ten years than the first year or two after the cure has been effected. I should not call any case a cure until after at least two years of this progressive improvement had been noted. —E. Sturridge, *Journ. Allied Dental Societies.*

Granuloma.—Dental literature coming out of New York City and its environs has recently contained much about a newly coined term in dental pathology—"granuloma." While I do not pose as an authority on general pathology, yet I have through careful reading, and through personal contact with authorities on the subject, gained information which prompts me to close my paper with an unfavorable criticism of the use of this word as now applied to the repair of periapical tissue.

A granuloma, so called, can only be present as a secondary process, never as a primary one. Such growths are brought about in the following manner: The irregular openings which remain in the tissue after the completion of an abscess evacuation must in some way be repaired. The invading leucocytes gradually become freed from the abscess walls, and the necrotic tissue which forms the pyogenic membrane gradually becomes covered with groups of growing connective tissue cells, known as granulation tissue, and when this assumes a tumor-like mass, as it frequently does in tuberculous and syphilitic patients, it forms a granuloma.

Authorities appear to differ as to the application of the term "granuloma," as now so frequently applied to periapical disease, but of one thing there can be no mistake; that is, unless there has been an active inflammation followed by suppuration, in other words, what we commonly call an alveolar abscess, there can be no granuloma, because the existence of the former is essential to the establishment of the latter. From the fact, however, that in the process of repair following an apical abscess, there is no neoplastic activity, nothing definite in the nature of a tumor, it would seem that the term "granuloma" is a misnomer.—I. N. Broomell, *Dental Items of Interest.*

Devitalization of Pulps in Bridge Work.—To arrive as quickly as possible at the conditions due to devitalization, let me quote a sentence from the writings of the late Dr. G. V. Black in his work on "Operative Dentistry." Dr. Black says: "A tooth from which the pulp has been removed seems never again to completely recover. Even though the person has not recognized the difference in the ordinary use of the teeth it shows in these trials [here Dr. Black is discussing the pressure which the teeth and surrounding tissues are capable of withstanding, as illustrated by the use of the gnathodynamometer]; the difference is generally considerable, though there are wide variations." There is perhaps no operation which we are called upon to perform about which more has been written than upon the question of treating and filling devitalized teeth. But all that has been written has not straightened a single tortuous root, nor enlarged a single constricted canal, nor rendered a single peridental membrane less liable to inflammation from putrescent tissue which cannot be easily removed because of physical hindrances.

I cannot hope to add anything to what Black and others have said concerning devitalized teeth. We know these facts from personal and oft-repeated observation:

(1) That to properly devitalize and fill a tooth involves much difficult and painstaking labor.

(2) That it is physically impossible to properly fill many teeth in the condition obtaining when they present for treatment.

(3) That devitalized teeth are incapable of withstanding the strain of pressure due to mastication as efficiently as teeth with vital pulps.

From these and other well-known phenomena it is safe to infer that devitalizing a tooth reduces its functional power as well as its power of resistance, and makes it increasingly liable to those pathological conditions which render its continued retention problematical. — A. W. THORNTON, *Dental Items of Interest.*

Technique of Using Schreier's Sodium and Potassium.—Schreier's preparation comes in a small glass tube, one end of which is open so that the alloy may be covered with paraffin, which prevents undue exposure to air and moisture. It is to the advocacy of Rhein that the preparation owes its popularity in this country. He has developed a technique which, if followed carefully, insures success. With the rubber dam adjusted and everything in readiness a barbed broach may be pushed through the paraffin cover and into the metallic mass; on its withdrawal, small particles adhere to the broach. It is best to have these particles as near the end of the broach as possible, in which manner the alloy is transferred to the canal. It is presumed that the canal is moist, which is generally the case. A violent reaction at once takes place; the metals attack the water molecule and hydroxids are formed, liberating hydrogen. If potassium predominates in the alloy, or even if it be present in equal proportion with the sodium, there is a sufficient amount of heat generated by the reaction to cause the liberated hydrogen to burn. To set the hydrogen off actively and start it burning requires a temperature of from 500° to 600° C. This burning of the hydrogen is an objection, in my opinion, and it was for this reason that I recommended the employment of an alloy with sodium predominating. After the initial reaction and the hydroxids are formed, they in turn act upon the fatty end-products, in case of a gangrenous pulp, forming a soluble soap. Where the organic tissue has not been decomposed by bacteria the action of the hydroxids differs somewhat in that the hydroxyl ion unites with the protein constituent of the tissue, forming a soluble alkaline albuminate. In either case, it will be observed, the product formed is *soluble*, and may be washed out of the canal, leaving it clean and sterile.

The action of potassium and sodium hydroxid on the contents of a canal of a tooth, whether or not the tissue is decomposed, is the same. When the salts and compounds of these metals are internally administered their action differs only in that the potassium ion is more depressant than the sodium ion in its influence upon the cardiac, muscular, and nervous systems. But in the canal of a tooth we do not have this pharmacologic effect of the metal ion; here we get only that which is desired—the chemical action of the hydroxyl ion.—J. P. BUCKLEY, *Journ. N. D. A.*

OBITUARY.

Dr. Corydon Palmer.

[SEE FRONTISPIECE.]

DIED, February 17, 1917, at the home of his son, Dr. Delos Palmer, New York City, in his ninety-eighth year, from a senile heart, CORYDON SPENCER PALMER, D.D.S.

Dr. Palmer was born January 12, 1820, at Vernon, Ohio, and received his early education in the public schools of that town. In 1836 he became apprenticed to a silversmith in Warren, Ohio, with whom he remained for four years, during which service, according to the custom of the period, his duties included at times work of the nature of dentistry. Moreover, as leading his thoughts in the direction of that which was to be his life occupation, it was during this apprenticeship as a silversmith that he became acquainted with Dr. E. E. Smith of Philadelphia, and from him he gained his first knowledge of actual "dentistry." Like many of the pioneers of our profession, Dr. Palmer "picked up" his knowledge of it from association and interchange of ideas with other practitioners. He opened an office in Warren in 1839.

In 1843 he went to New York City, with the intention of entering the engraving business, but, having become acquainted with Dr. John Burdell, decided instead to join him in the practice of dentistry. However, in 1844 he left New York for New Bedford and associated himself with Dr. E. G. Ward for one year; then he returned to New York and resumed his connection with Dr. Burdell for a short time; but, as already stated, Warren, Ohio, was destined to be the scene of his lifework—save for the period now to be mentioned.

Through Dr. Burdell, Dr. Palmer became acquainted with Samuel S. White, who was just at that time establishing a dental depot in New York City, and as the result of this acquaintance Dr. Palmer later became associated with Dr. White, with whom he engaged himself and remained for some years in the capacity of advisory expert in the manufacture of steel instruments for use in dentistry.

Dr. Palmer was of an inventive turn of mind, and it is claimed that he invented the first complete set of instruments for the manipulation of cohesive gold foil, of which he was noted as one of the most expert manipulators of his day, and was said by Dr. Allport to be "the best filler of teeth in the world."

For a number of years Dr. Palmer was a member of the board of trustees and at one time teacher of operative dentistry in the Ohio College of Dental Surgery, which institution conferred upon him the honorary degree of D.D.S. He was a member of the Ohio Dental Society, the Mississippi Valley Association of Dental Surgeons, the American (now the National) Dental Association, and honorary member of several other dental societies.

In 1914 Dr. Palmer was compelled on account of his advanced age to give up the practice of dentistry, and went to live with his son in New York, remaining there until his death.

His remains were interred at his old home, Warren, Ohio, in the Oakwood Cemetery, where it had always been his wish to finally rest.

Dr. Arthur Holbrook.

DIED, Tuesday, January 23, 1917, at the home of his son in Milwaukee, in his seventy-fifth year, ARTHUR HOLBROOK, D.D.S.

Dr. Holbrook was born on June 4, 1842, in Madrid, St. Lawrence county, N. Y., where his early education was obtained, his father removing to Wisconsin in his early youth. He began the study of dentistry in 1860 under his father, and later continued under his uncle at Waukesha. At the outbreak of the civil war he enlisted at the first call for ninety-day troops, re-enlisted in the three-year service and went to the front with Company F, Fifth Wisconsin infantry. He was sergeant of his company through the campaign on the Potomac until the autumn of 1862, when he was made first lieutenant of Company A, Twenty-eighth Wisconsin infantry, and at the time of General Forrest's raid on Memphis he was acting assistant adjutant-general of the Fourth brigade. On being mustered out in the autumn of 1864, Dr. Holbrook resumed the study of dentistry at the Philadelphia Dental College, from which institution he was graduated in 1867.

Dr. Holbrook and Dr. C. C. Chittenden, Madison, were the first two graduate dentists in Wisconsin.

Dr. Holbrook was founder and first president of the Milwaukee Odontological Society, an honorary life member of the National Dental Association, a charter member and several times president of the Wisconsin State Dental Society, being an honorary life member. He was a member of the Grand Avenue Congregational Church, a charter member of Lafayette Lodge, F. and A. M., a charter and demitted member of Calumet Chapter, R. A. M., and of Ivanhoe Commandery, Knights Templar. He was a member of E. B. Wolcott Post, G. A. R., a member and once commander and chaplain of Wisconsin Commandery, Loyal Legion of the United States, a member of the Association of the Fifth Wisconsin Volunteer Infantry, and a member of the Association of the Twenty-eighth Wisconsin Volunteer Infantry.

In 1868 Dr. Holbrook was married to Josephine Tenney, daughter of Mr. and Mrs. E. P. Tenney, New York. He is survived by two sons and two daughters—Dr. A. T. and Harold E. Holbrook and Mrs. T. H. Spence, Milwaukee, and Mrs. Barent G. Poucher, Glencoe, Ill.

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DENTAL LEGISLATION

Dental Law of the Bahamas—"Colony of New Providence."

THE DENTISTS ACT, 1916.

AN ACT

FOR THE REGISTRATION OF DENTISTS.

May it, etc.

1. This Act may be cited as "The Dentists Act, 1916."

2. From and after the commencement of this act, save as in this act provided, it shall be unlawful for any person to practice dentistry within the Colony unless such person is registered under this act. *Provided always*, that this section shall not apply to any person who, prior to the commencement of this act, has been engaged in the practice of dentistry, in New Providence, for a period of one year prior to the first day of January 1917, and that any such person shall be entitled to a certificate of registration from the Colonial Secretary without any payment therefor.

3. A person shall be deemed to practice dentistry and to act as an operator in dental surgery, within the meaning of this act, who, for pecuniary or other valuable consideration, treats or holds himself out as being able to treat, heal, cure or relieve diseases, lesions, or pain of the human teeth or jaws, or performs any operation of any kind thereon, or inserts any artificial teeth, fixtures, or appliances for the restoration, regulation, or improvement of the dental organs.

4. It shall be lawful for the Governor in Council to direct the registration, under this

act, of any of the following classes of persons who may apply to the Colonial Secretary for such registration:

(*a*) Any person who holds a degree or diploma as a dentist, of any university or institution of the United Kingdom or of his Majesty's dominions, colonies, or any British possession, authorized by law to grant degrees or diplomas in dentistry.

(*b*) Any person who holds a degree or diploma in dentistry, of any university or institution in any foreign country, which is authorized by the law of such country to grant degrees or diplomas in dentistry, and which the Governor in Council may determine to recognize for the purposes of this act.

5. There shall be issued to any person registered as a dentist under this act a certificate under the seal of the Colony.

6. (1) It shall be lawful for the Governor in Council to grant to any person resident in an Out Island, who is recommended by the Commissioner of the district, a license to practice dentistry, to the extent and under the conditions mentioned in the license.

(2) Any license so issued may at any time be revoked, amended, or altered by the Governor in Council.

(3) Any person to whom a license has been issued, who shall practice dentistry in any manner contrary to any of the provisions of the license issued to such person under this section, shall be liable on summary conviction to a penalty of £20.

7. (1) There shall be published annually in the *Gazette*, a list of persons to whom licenses have been issued under this act.

(2) The list shall state the district of the Colony in which persons to whom licenses have been issued are authorized to practice, and should indicate the terms and conditions imposed under such licenses.

(3) Printed copies of the list containing the names of persons to whom licenses have been issued shall be supplied by the Colonial Secretary to the stipendiary and circuit magistrates, commissioners and justices of the peace, of the Out Island districts of the Colony, and it shall be the duty of such magistrates, commissioners, and justices, to keep the said printed copies publicly exhibited in some conspicuous place at their respective offices or residences.

8. Any person who shall fraudulently procure or attempt to procure himself or any other person to be registered under this act shall be guilty of an offense against this act.

9. Any person not registered as a dentist under this act, who shall wilfully and falsely pretend to be, or to take or use the name or title of a Dentist, Doctor of Dental Surgery, Professor, or any name, title, addition, or description implying, whether in itself or in the circumstances in which it is used, that such person is a dentist, or that such person is qualified to heal or treat dental disorders or derangements, whether by dentistry or any other means of any kind or description whatsoever, shall be guilty of an offense against this act.

Provided, that nothing in this section shall preclude any dentist qualified for registration as a dentist, under this act, but not desiring to practice dentistry, from using any name or title usually borne by dentists.

10. Any person not registered under this act as a dentist, who shall practice dentistry, shall be guilty of an offense against this act.

11. Any person guilty of an offense against this act for which no specific penalty is provided shall be liable on summary conviction:

(*a*) In respect of the first offense to a penalty of £100.

(*b*) In respect of a subsequent offense to a penalty of £200, together with imprisonment for six months.

12. No person shall be prosecuted for an offense against this act except upon the fiat of the Attorney-general.

13. In any proceedings for an offense against this act, in which it is necessary to prove that any person is not registered under this act, or that a license has not been granted to him under this act, such person shall be deemed not to be registered or licensed until the contrary is shown.

14. (1) Except as in this act provided, every person applying for registration as a dentist, under this act, shall pay a fee of £5 5s. 0d., before the issue to him of the certificate of registration.

(2) Every person applying for a license under this act, shall, before the license is granted, pay a fee of 1s. for such license.

(3) All fees payable under this section shall be paid to the Treasurer for the public uses of the Colony.

15. This act shall not prohibit a medical practitioner, registered under "The Medical Act 1906," or any act relating to the registration of medical practitioners, from extracting teeth for the relief of pain, or applying remedies for such purposes.

Assented to and in effect as law, August 10, 1916.

SPECIAL NOTICE.

Information Relating to Appointments

IN THE

DENTAL RESERVE CORPS OF THE ARMY.

The National Defense Act of June 3, 1916, and the tentative regulations thereunder, provide for a dental section or branch of the Officers' Reserve Corps. The officers of the Dental Reserve Corps have the rank of first lieutenant, and are appointed and commissioned by the President, after having been found, upon examination prescribed by him, physically, mentally, and morally qualified to hold such commissions. Commissions are issued for periods of five years, at the end of which time the officers may be recommissioned, subject to such further examinations and qualifications as the President may prescribe. They are subject to call for duty in time of actual or threatened hostilities only. While on active duty under such call, they are entitled to the pay and allowances (including quarters, fuel, and light) of their grade. They are entitled also to pension for disability incurred in the line of duty and while in active service. They are not entitled to pay or allowances except when in active service, nor to retirement or retired pay.

Appointees must be citizens of the United States, between twenty-two and fifty-five years of age, must be graduates of standard dental colleges, and must, at the time of appointment, be in the active practice of their profession in the states in which they reside.

The examination is physical and professional. It is conducted by boards consisting in each case of one medical and two dental officers of the Army, designated by the War Department.

The examination as to physical qualifications conforms to the standard required of recruits for the United States Army. Defects of vision resulting from errors of refraction which are not excessive, and which may be entirely corrected by glasses, do not disqualify unless they are due to or are accompanied by organic disease. Minor physical deficiencies may be waived.

The professional examination will be oral. If the applicant fails therein, he may, if he desires, have a written examination. An average of 75 per cent. is required to qualify in the examination. The examination comprises the following subjects:

(1) Dental pathology and bacteriology.
(2) Chemistry, physics, and metallurgy.
(3) Recent advances in dental surgery and technique.

Applications for appointment in the Dental Reserve Corps must be made in writing, upon the prescribed blank form, to the Surgeon-general of the Army, Washington, D. C., who will supply the blank upon request. The correctness of the statements made in the application must be sworn to by the applicant before a notary public or other official authorized by law to administer oaths. It must be accompanied by testimonials based upon personal acquaintance from at least two reputable persons, as to the applicant's citizenship, character, and habits, and by his personal history given in full upon the blank form furnished him for the purpose.

SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS not later than the 11th or 12th of the month preceding that of publication.

Coming Dental Society Meetings:

May, June, and July.

MAY.

DENTAL SOCIETY OF THE STATE OF NEW YORK. Rochester. May 10th to 12th.

ILLINOIS STATE DENTAL SOCIETY. Quincy. Four days: May 8th to 11th.

INDIANA STATE DENTAL ASSOCIATION. Indianapolis. Three days: May 15th to 17th.

KENTUCKY STATE DENTAL ASSOCIATION. Louisville. Three days: May 9th to 11th.

LAKE ERIE DENTAL ASSOCIATION. Cambridge Springs, Pa. May 24th to 26th.

MASSACHUSETTS STATE DENTAL SOCIETY. Springfield. Three days: May 3d to 5th.

NORTH DAKOTA DENTAL ASSOCIATION. Fargo. Two days: May 15th and 16th.

SOUTH CAROLINA STATE DENTAL ASSOCIATION. Columbia. Three days: May 8th to 10th.

SUSQUEHANNA DENTAL ASSOCIATION OF PENNSYLVANIA. Allentown. Three days: May 22d to 24th.

VERMONT STATE DENTAL SOCIETY. Burlington. Three days: May 16th to 18th.

JUNE.

AMERICAN MEDICAL ASSOCIATION. New York City. Five days: June 4th to 8th.

CALIFORNIA STATE DENTAL ASSOCIATION. San Francisco. Four days: June 6th to 9th.

CONNECTICUT STATE DENTAL ASSOCIATION. New London. Three days: June 14th to 16th.

GEORGIA STATE DENTAL SOCIETY. Brunswick. Three days: June 14th to 16th.

MASSACHUSETTS BOARD OF EXAMINERS. Boston. June 22d to 30th.

NEBRASKA STATE DENTAL SOCIETY. Omaha. Four days: June 4th to 7th.

NORTH CAROLINA DENTAL SOCIETY. Durham. Three days: June 27th to 29th.

NORTHERN OHIO DENTAL ASSOCIATION. Cleveland. Three days: June 7th to 9th.

NORTHWESTERN UNIVERSITY DENTAL SCHOOL—ALUMNI ASSOCIATION. Chicago. June 11th and 12th.

PENNSYLVANIA STATE DENTAL SOCIETY. Philadelphia. Three days: June 26th to 28th.

POSTGRADUATE DENTAL MEETING. [ALABAMA, MISSISSIPPI, TEXAS, AND LOUISIANA.] New Orleans. Four days: June 4th to 7th.

TENNESSEE STATE DENTAL ASSOCIATION. Memphis. Four days: June 19th to 22d.

WYOMING STATE DENTAL ASSOCIATION. Cheyenne. Two days: June 18th and 19th.

JULY.

NEW JERSEY STATE DENTAL SOCIETY. Atlantic City. Three days: July 11th to 13th.

Examiners' Meetings.

ALABAMA BOARD OF EXAMINERS. Birmingham. June 18th.

ARKANSAS BOARD OF EXAMINERS. Little Rock. June 21st to 23d.

CALIFORNIA BOARD OF EXAMINERS San Francisco, June 8th; Los Angeles, June 22d.

ILLINOIS BOARD OF EXAMINERS. Chicago. June 15th.

MAINE BOARD OF EXAMINERS. Augusta. July 12th to 14th.

MARYLAND BOARD OF EXAMINERS. Baltimore. May 30th and 31st.

MISSISSIPPI BOARD OF EXAMINERS. Jackson. June 19th.

MISSOURI BOARD OF EXAMINERS. Jefferson City. June 11th to 13th.

MONTANA BOARD OF EXAMINERS. Helena. July 9th to 13th.

NEVADA BOARD OF EXAMINERS. Reno. June 7th.

New Hampshire State Dental Board. Manchester. June 28th to 30th.

New Jersey Board of Registration. Trenton. June 25th to 28th.

Oklahoma Board of Examiners. Oklahoma City. June 25th.

Pennsylvania Board of Examiners. Philadelphia and Pittsburgh. June 13th to 16th.

Rhode Island Board of Examiners. Providence. July 5th to 7th.

South Carolina Board of Examiners. Columbia. June 26th.

Texas Board of Examiners. Houston. June 18th.

Vermont Board of Examiners. Montpelier. June 25th to 27th.

Virginia Board of Examiners. Richmond. June 12th.

Wisconsin Board of Examiners. Milwaukee. June 20th.

Wyoming Board of Examiners. Cheyenne. June 26th to 28th.

National Mouth Hygiene Association.

Department of Extension Lectures.

A complete lecture set, consisting of full manuscript and thirty-six specially selected and prepared lantern slides covering the subject of Mouth Hygiene, is furnished by this association to members of state dental societies and others who may be considered as qualified to present the subject on the lecture platform.

For rental and sale terms and other particulars address

Edwin N. Kent,
Director of Extension Lectures,
330 Dartmouth st., Boston, Mass.

American Institute of Dental Teachers.

At the last annual meeting of the American Institute of Dental Teachers, held in Philadelphia, Pa., January 23 to 25, 1917, the following officers were elected: Dr. John F. Biddle, 517 Arch st., Pittsburgh, Pa., president; Dr. A. W. Thornton, McGill University, Montreal, Que., vice-president; Dr. Abram Hoffman, 529 Franklin st., Buffalo, N. Y., secretary-treasurer. Executive Board — Dr. R. W. Bunting, Ann Arbor, Mich., Dr. A. D. Black, Chicago, Ill., Dr. G. S. Millberry, San Francisco, Cal.

The next annual meeting will be held January 29, 30, and 31, 1918. The place of meeting will be announced later.

Pennsylvania College of Dental Surgery.

Attention of Class of 1892.

The members of the class of 1892, Pennsylvania College of Dental Surgery, are requested to send their names and present location to the undersigned. The holding of the twenty-fifth anniversary of the class is the object in view.

J. E. Mitinger,
Greensburg, Pa.

National Association of Dental Faculties.

The 1917 meeting of the National Association of Dental Faculties will be held at the Astor Hotel, New York City, Friday and Saturday, October 19 and 20, 1917.

The Executive Committee will meet at 9 a.m., and the general session will open at 10 o'clock as usual.

Chas. Channing Allen, *Sec'y,*
N. W. Cor. 10th and Troost, Kansas City, Mo.

Illinois State Dental Society.

The fifty-third annual meeting of the Illinois State Dental Society will be held at Quincy, Ill., May 8, 9, 10, and 11, 1917.

Henry L. Whipple, *President,*
J. P. Luthringer, *Sec'y.*

Kentucky State Dental Association.

The next annual meeting of the Kentucky State Dental Association will be held in Louisville the three days previous to the Kentucky Derby, May 9, 10, and 11, 1917. Address all correspondence to

W. M. Randall, *Sec'y,*
Louisville, Ky.

Vermont State Dental Society.

The next meeting of the Vermont State Dental Society will be held May 16 to 18, 1917, at Burlington, Vt.

P. E. Mellen, *Sec'y,*
Middlebury, Vt.

Lake Erie Dental Association.

The fifty-fourth annual meeting of the Lake Erie Dental Association will be held at the Hotel Barlett, Cambridge Springs, Pa., on May 24, 25, and 26, 1917.

D. S. Sterrett,
Erie, Pa.

North Dakota Dental Association.

The North Dakota State Dental Association will meet in Fargo, May 15, and 16, 1917. Good clinics and exhibits by manufacturers. All members of the National Dental Association or any state society are cordially invited to attend.

Solon Crum, *Sec'y,*
Fargo, N. D.

Indiana State Dental Association.

The fifty-ninth annual meeting of the Indiana State Dental Association will be held at the Claypool Hotel, Indianapolis, on May 15, 16, and 17, 1917. A very good program of papers and clinics has been prepared, and a sincere invitation is extended to members of other state dental associations to attend.

A. R. Ross, *Sec'y,*
LaFayette, Ind.

Massachusetts State Dental Society.

The forty-third annual meeting of the Massachusetts Dental Society will be held in Springfield, Mass., May 3, 4, and 5, 1917. This meeting will have as its keynote, "Better Dental Service Through Efficiency."

Efficiency in office equipment and management is a subject that will be well covered. The meeting, then, will train the members for efficiency in their work, and will afford the members an opportunity to combine outdoor recreation with professional study and acquaintance.

Harold H. Cleaveland, D.D.S., *Pres.*
Springfield, Mass.
C. Edson Abbott, D.D.S., *Editor,*
Franklin, Mass.

Susquehanna Dental Association of Pennsylvania.

The fifty-fourth annual meeting of the Susquehanna Dental Association will be held in the Odd Fellows' Temple, 118 N. Ninth st., Allentown, Pa., May 22, 23, and 24, 1917. The high standard of meetings set by the Susquehanna is being kept in mind, and the committee is sparing no effort to make this a meeting which, for benefit and pleasure, will be long remembered.

Odd Fellows' Temple is admirably adapted to our purpose, and easy of access, as you will agree when you have seen it. We think it is superior to any meeting-place we have had.

The exhibits show promise of being better than ever, and will be splendidly taken care of in the spacious auditorium. We have procured eminent essayists and clinicians for the meeting, and promise you some pleasant surprises in a later announcement, giving their names and subjects.

This meeting will be so good that you cannot afford to miss it. If you are in a rut, come and let us help you out of it. Your presence is all that is required to make the 1917 meeting a real success. Cross off the dates in your appointment book now.

Howard S. Seip, *Ch'man Ex. Com.*

Northern Ohio Dental Association.

The sixtieth annual meeting of the Northern Ohio Dental Association will be held at Hotel Statler, Cleveland, Ohio, June 7, 8, and 9, 1917.

An attractive program is being arranged, and this promises to be one of the most interesting meetings held by the Northern Ohio Dental Association.

C. H. Clark, *Sec'y,*
Youngstown, Ohio.

South Carolina State Dental Association.

The forty-seventh annual meeting of the South Carolina State Dental Association will be held in Columbia, S. C., at the Jefferson Hotel, on May 8, 9, and 10, 1917.

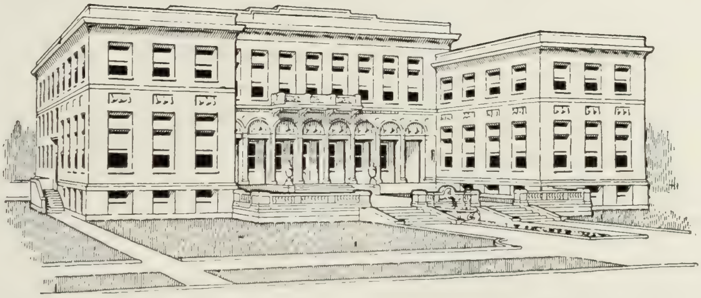
J. T. Montgomery, *Pres.,*
Spartanburg, S. C.
Ernest C. Dye, *Sec'y,*
Greenville, S. C.

Dental Society of the State of New York.

ANNUAL MEETING, ROCHESTER, MAY 10-12, 1917.

The forty-ninth annual meeting of the Dental Society of the State of New York will be held in Convention Hall, Rochester, N. Y., May 10, 11, and 12, 1917.

Note that the dedication of the Rochester Dental Dispensary—the gift of Mr. George Eastman to the city of Rochester—will take place on Wednesday, May 9th, and the profession is cordially invited.



ROCHESTER'S NEW DENTAL DISPENSARY

WILL BE

Formally Dedicated May 9, 1917,

IN CONJUNCTION WITH THE

Forty-ninth Annual Convention of the Dental Society of the State of New York.

Men of national reputation will be here with messages of vital importance to you. Make your reservations today.

THE COMMITTEE.

Edward G. Link, *Chairman,*
226 Cutler Bldg., Rochester, N. Y.
Louis Meisburger, Rochester, N. Y.
Wirt H. Conklin, Rochester, N. Y.

The Executive Council will meet in Buffalo on the afternoon of May 9th, organize, and then adjourn, to meet in Rochester the following day.

The program of essays and clinics, coupled with other educational features and many forms of entertainment, will make this one of the most successful meetings in the history of the New York Society; in fact, it will be one of the big meetings of the year.

The manufacturers' exhibit will be exceptionally beautiful, and will include practically every up-to-date product, appliance, etc., in the dental trades.

All exhibits, clinics, and meetings will be held in Convention Hall, located in the heart of the city and near the hotels, theaters, and the retail shopping district.

The month of May is exceptionally beautiful in Rochester (the Flower City), which is famous for its beautiful homes, parks, scenery, and extensive gardens.

The officials and members of the New York Society extend to all ethical dentists a most cordial and fraternal greeting to meet with them, together with the assurance that everything possible will be done to make the visit a pleasant and profitable one.

Programs and general information can be obtained of

A. P. Burkhart, *Sec'y,*
52 Genesee st., Auburn, N. Y.

American Medical Association.

NEW YORK CITY, JUNE 4 TO 8, 1917.

(Clinical Congress—4th and 5th.)

THE American Medical Association will hold its annual meeting in New York City, June 4 to 8, 1917. In all probability this will be the greatest meeting of medical men ever held in this country. The Committee on Arrangements consists of Drs. Wendell C. Phillips, Floyd M. Crandall, and Alexander Lambert. Headquarters at 17 West 43d st., New York City, to which all communications should be addressed. Monday and Tuesday, June 4th and 5th, will be devoted to a Clinical Congress. All departments of medicine will be represented, each department to have its own series of clinics, occurring in different parts of the city.

* * * * *

The great number of clinics, their scope and scientific value, will be unprecedented. The program is in active preparation, soon to appear in full in the *Journal* of the A. M. A.

Between seven and ten thousand physicians are expected to attend this congress, and it is hoped that dental practitioners throughout the country will utilize this opportunity to become associate fellows of the Section on Stomatology, and thus be entitled to attend these clinics as well as the regular meeting of the association on June 6–8. The following is from a letter of the General Secretary:

> Dentists holding the degree of D.D.S. who are members of state or local dental societies and who are not eligible to regular membership, may be elected to associate fellowship by the House of Delegates of the American Medical Association when a formal application for such associate fellowship has been approved by the Section on Stomatology. In other words, when a dentist holding the required degree makes formal application for associate fellowship, accompanying this application with a certificate from the secretary of his state or local dental society, which certificate certifies to his being a member in good standing in that body, this application and the attached certificate is forwarded to the secretary of the Section on Stomatology for the approval of that section. The application is then in form for presentation to the House of Delegates for the election or rejection of the applicant.
>
> We shall be glad to transmit any such applications, or they may be sent direct to the secretary of the Section on Stomatology, Dr. Eugene S. Talbot, 31 N. State st., Chicago.

Following is the program of the Section on Stomatology:

WEDNESDAY, 9 A.M.

(1) Chairman's Address: "Radiographic and Microscopic Studies of the Tissues Involved in Chronic Mouth Infections." Dr. Arthur D. Black, Chicago, Ill.

(2) "Chronic Diseases of the Mouth of Interest to Both Physician and Dentist." Dr. Kurt H. Thoma, Boston, Mass.

(3) "Cysts of the Dental System." Dr. Kaethe W. Dewey, Chicago, Ill.

(4) "A Study of the Infectious Granular Tissue Found at the Apices of Pulpless Teeth Commonly Called Chronic or Blind Abscesses." Dr. Herbert A. Potts, Chicago, Ill.

(5) "The Relation of Devitalized Teeth to Focal Infection." Dr. M. L. Rhein, New York City.

WEDNESDAY, 2 P.M.

(6) "Epithelioma or Cancer of the Mouth." Dr. L. Duncan Bulkely, New York City.

(7) "Treatment of Cancer of the Mouth by Electric Cautery, With or Without Operative Measures." Dr. J. W. Bransfield, Philadelphia, Dr. G. M. Dorrance, Philadelphia.

Discussion—Dr. Albert Ochsner, Chicago, Ill.; Dr. Joseph Bloodgood, Baltimore, Md.

(8) "Injuries of Temporo-Maxillary Articulation, Their Diagnosis and Treatment." Dr. Henry S. Dunning, New York City.

(9) "Tuberculosis of the Tongue." Dr. John W. Means, Columbus, Ohio; Dr. Jonathan Forman, Columbus, Ohio.

THURSDAY, 9 A.M.

(10) "Bone Surgery as Applied to the Jaws, with Special Reference to Bone Regeneration." Dr. M. I. Schamberg, New York City.

(11) "A Composite Osteoplastic Closure of Clefts of the Hard Palate." Dr. John B. Roberts, Philadelphia.

(12) "The Use of Soup Bone for the Correction of Deformities or Defects of the Skull

and Face." Dr. Wayne W. Babcock, Philadelphia.

Discussion—Dr. Allen B. Kanavel, Chicago, Ill.; Dr. Frederick B. Moorehead, Chicago, Ill.; Dr. Geo. V. I. Brown, Milwaukee, Wis.; Dr. Thomas L. Gilmer, Chicago, Ill.

(13) "A New Operation for the Immediate Surgical Separation of the Superior Maxillary Bones to Widen the Nares for the Improvement of Respiratory and Other Conditions." Dr. Geo. V. I. Brown, Milwaukee, Wis.

Discussion—Dr. J. S. Evans, Madison, Wis.; Dr. G. L. Bellis, Wauwatosa, Wis.; Dr. O. H. Foerster, Milwaukee, Wis.; Dr. D. F. MacMillan, Chicago, Ill.

THURSDAY, 2 P.M.

(14) "War Experiences with Wounds of the Head, Face, and Jaws." Dr. Joseph Eastman, Indianapolis.

Discussion—Dr. Henry H. Lyle, New York City; Dr. Geo. G. Davis, Chicago, Ill.; Dr. Kellogg Speed, Chicago, Ill.

(15) "A Preliminary Report of Investigations as to the Frequency of Metastatic Eye Infections from Primary Dental Foci." Dr. Joseph M. Levy, New York City.

All who are interested in the program are invited to be present and take part in the discussions.

ARTHUR D. BLACK, *Chairman*,
EUGENE S. TALBOT, *Sec'y*.

Headquarters of the Section on Stomatology will be at the Hotel Astor, Broadway and 45th st.

No more impressive opportunity for the fraternization of dental and medical men has ever been presented in the history of the profession. Every dentist who reads this announcement should enroll immediately in the Section on Stomatology (annual dues $5, which entitles him to the weekly *Journal* of the A. M. A.), and thus place himself in direct touch with the greatest happenings in medical science.

The Clinical Committee of the Section on Stomatology is as follows:

HENRY W. GILLETT,
ARTHUR L. SWIFT,
WM. D. TRACY,
HENRY S. DUNNING,
ARTHUR H. MERRITT,
WM. B. DUNNING, *Chairman*,
140 West 57th st., New York City.

Pennsylvania State Dental Society.

THE forty-ninth annual meeting of the Pennsylvania State Dental Society will be held in Philadelphia, June 26, 27, and 28, 1917, at the Bellevue-Stratford Hotel.

J. F. BIDDLE, *Sec'y*,
Pittsburgh, Pa.

Wyoming State Dental Association.

THE Wyoming State Dental Association will hold its second annual meeting in Cheyenne, June 18 and 19, 1917. All members holding National cards are cordially invited.

PETER APPEL, JR., *Sec'y*,
Cheyenne, Wyo.

North Carolina Dental Society.

THE North Carolina Dental Society will hold its forty-third annual meeting at Durham, N. C., June 27, 28, and 29, 1917.

R. M. SQUIRES, *Sec'y*,
Wake Forest, N. C.

Nebraska State Dental Society.

THE Nebraska State Dental Society will hold its fiftieth annual meeting, in celebration of its golden jubilee, in Omaha, June 4, 5, 6, and 7, 1917. All members of the National Association are cordially invited.

H. E. KING, *Sec'y*, Omaha, Neb.

California State Dental Association.

THE California State Dental Association will hold its regular annual session for the year 1917 in San Francisco, Cal., June 6, 7, 8, and 9, 1917. A cordial invitation is extended to members of other associations.

For further information, and particulars regarding exhibit space, communicate with

JOHN E. GURLEY, *Sec'y*,
350 Post st., San Francisco, Cal.

Tennessee State Dental Association.

THE "golden jubilee" of the Tennessee Dental Association will be held in Memphis, June 19, 20, 21, and 22, 1917. The officers promise the most attractive program ever presented in the South. Social features will be prominent. All ethical dentists invited. Come and bring your wives.

D. M. CATTELL, *President*,
C. E. HINES, *Sec'y*.

Northwestern University Dental School.

ALUMNI ASSOCIATION CLINIC.

THE Northwestern University Dental School Alumni Association will hold the Annual Home-coming Clinic, 31 W. Lake st., Chicago, Ill., June 11 and 12, 1917. Good program for each day. All alumni are urged to attend this, which is expected to be the best meeting in the history of the organization.

M. M. PRINTZ, *Sec'y*,
4235 Lake Park ave., Chicago.

Postgraduate Dental Meeting:

Alabama, Mississippi, Texas, and Louisiana.

THE states of Alabama, Mississippi, Texas, and Louisiana will hold a joint postgraduate meeting on June 4, 5, 6, and 7, 1917, in New Orleans, La. This will be immediately followed by a special detailed technical course, negotiations for which are being made with some of the most talented clinicians throughout the country. The time of the meeting, June 4th to June 7th, besides being a most agreeable season of the year, enables the committee to secure the services of experts in the work to be covered by the meeting, who would not be accessible at an earlier time in the year.

The subjects which will be covered during the meeting proper, by illustrated lectures, moving pictures, and clinics, and which will be given in their entirety, are—"Removable Bridge Work," with the most advanced lock and saddle construction. "New Methods of Replacing Lost Teeth Without Mutilation of Sound Members by a System of Saddles, Cast Inlay-fitting Clasps," etc. "Nerve Blocking," including the various phases of local anesthesia. "Radiography." "Root-canal Preparation and Filling." "Apicoectomy." "Treatment of Fractures of the Maxilla and Mandible." "Treatment of the Maxillary Sinus." "Prophylaxis, Periodontia, and Stomatology."

Experts placed in charge of the above subjects will each give special courses, starting immediately after the meeting, and lasting two or three days, or a little longer where the nature of the work requires it. Classes will be formed from among holders of membership cards to the meeting, which none but ethical dentists can obtain. These classes must necessarily be limited in size. Early application for membership and for special courses is urged, and the latter cannot be had without the former. Enrolment in order of registration. Apply to Dr. C. V. Vignes, chairman Committee on Credentials and Registrations, 709 Macheca Bldg., New Orleans.

The committees representing the four states will conjointly fix membership fees.

The Committee on Publicity, Dr. J. P. Wahl, chairman, 1135 Maison Blanche Building, New Orleans, will shortly issue summaries of the work to be taught by each instructor at the meeting. Arrangements are being made relative to railroad and hotel rates, exhibits, entertainment, clinics, and floor arrangements, and will be announced later.

JULES J. SARRAZIN, *General Chairman*,
LEO C. DEMPSEY, *General Sec'y*,
Louisiana Committee.

Georgia State Dental Society.

THE forty-eighth annual meeting of the Georgia State Dental Society will be held at Brunswick, Ga., June 14, 15, and 16, 1917, beginning Thursday, June 14th. We extend a most cordial invitation to members of other associations to meet with us.

For application blanks and full particulars, address

M. M. FORBES, *Sec'y*,
803, 804 Candler Bldg., Atlanta, Ga.

New Jersey State Dental Society.

THE forty-seventh annual convention of the New Jersey State Dental Society will be held at Atlantic City, N. J., on July 11, 12, and 13, 1917.

The entire convention will be held on Young's Million Dollar Pier. Machinery Hall will be used for the exhibits. Dr. George W. Wakeley of Orange, N. J., is chairman of the committee, and with 25,000 square feet of space available, expects to have the greatest display of dental goods in the history of the society. Machinery Hall extension, with about 10,000 square feet of space, will give ample space for clinics and meetings.

Dr. Charles A. Spahn of Newark, N. J., is chairman of the Clinic Committee, and will present some entirely new clinics. Dr. Raymonde A. Albray of Newark, N. J., chairman of the Essay Committee, has arranged for essayists of prominence, whose names will be announced later.

The headquarters of the society will be on the pier, and mail may be directed to exhibitors, clinicians, or members in care of the secretary of the New Jersey State Dental Society, Young's Million Dollar Pier, Atlantic City, N. J. A list of hotels where special rates may be secured will be published in the *Journal*, and mailed prior to the convention.

A cordial invitation is extended to ethical practitioners.

JOHN C. FORSYTH, *Sec'y*,
430 E. State st., Trenton, N. J.

Connecticut State Dental Association.

THE fifty-third annual meeting of the Connecticut State Dental Association will be held at the Hotel Griswold, New London, Conn., June 14, 15, and 16, 1917.

Papers and clinics of unusual interest have been secured, which with the excellent accommodations offered by the Griswold, will make this one of the most attractive meetings in the history of the association.

GEO. S. B. LEONARD, *Sec'y*,
Mystic, Conn.

New Hampshire State Dental Board.

THE New Hampshire State Dental Board will hold its next examinations on June 28, 29, and 30, 1917, in Masonic Banquet Hall, Manchester, N. H. Application blanks and further information may be obtained of

HARRY L. WATSON, *Sec'y*,
913 Elm st., Manchester, N. H.

Maryland Board of Examiners.

THE Maryland Board of Dental Examiners will meet for examination of candidates for certificates on May 30 and 31, 1917, at the Dental Department of the University of Maryland, Baltimore, at 9 A.M.

For application blanks and further information address

F. F. DREW, *Sec'y*,
701 N. Howard st., Baltimore, Md.

Arkansas Board of Examiners.

THE Arkansas State Board of Dental Examiners will hold its annual meeting and examination at the Marion Hotel, in Little Rock, Ark., on Thursday, Friday, and Saturday, June 21, 22, and 23, 1917.

Applicant for examination must be a graduate of a reputable dental school. Examination theoretical and practical. Fee and application should be filed as soon as convenient, and at latest ten days before the examination. For further information address

I. M. STERNBERG, *Sec'y*,
Fort Smith, Ark.

Pennsylvania Board of Examiners.

THE next examination of the Pennsylvania Board of Dental Examiners will be held in Musical Fund Hall, 808 Locust st., Philadelphia, and the College of Pharmacy Building, Pittsburgh, on Wednesday, Thursday, Friday, and Saturday, June 13, 14, 15, and 16, 1917. The examination in operative dentistry will be held on Wednesday, June 13th, at 8.30 o'clock, in the Evans Dental Institute, 40th and Spruce sts., Philadelphia, and the University of Pittsburgh Dental Building, Pittsburgh; prosthetic dentistry Wednesday, 1.30. Application papers can be secured from the department of Public Instruction, Harrisburg. For further information address

ALEXANDER H. REYNOLDS, *Sec'y*,
4630 Chester ave., Philadelphia, Pa.

New Jersey Board of Registration.

THE State Board of Registration and Examination in Dentistry in New Jersey will hold their annual meeting and examinations in the Assembly chamber, at the State-house, Trenton, N. J., on June 25, 26, 27, and 28, 1917. License fee $25, re-examination fee $10.

Attention is directed to the following quotation from the dental law of New Jersey: "Applicant shall present to said board a certificate from the commissioner of education of this state, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study in an approved public or private high school, or the equivalent thereof." [Those who entered a dental college prior to January 1, 1914, must present a certificate showing a three-year high school course.] In accordance with this law the secretary will issue application blanks only upon presentation of the required certificate from the commissioner of education, State-house, Trenton, N. J.

Applications must be filed complete ten days before the date of the examination. Address all communications for further particulars to

JOHN C. FORSYTH, *Sec'y*,
430 E. State st., Trenton, N. J.

Missouri Board of Examiners.

THE next meeting of the Missouri Dental Board will be held in Jefferson City, June 11, 12, and 13, 1917, commencing Monday morning at 8 o'clock.

Applications must be in the hands of the secretary ten days before examination. For further information address

V. R. MCCUE, *Sec'y*,
Cameron, Mo.

South Carolina Board of Examiners.

THE next annual meeting of the South Carolina State Board of Dental Examiners will be held at the Jefferson Hotel, Columbia, S. C., beginning promptly at 9 o'clock Tuesday morning, June 26, 1917. All applications to be in the hands of the secretary by June 16th.

Application blanks and full information may be obtained by addressing

R. L. SPENCER, *Sec'y*,
Bennettsville, S. C.

Wyoming Board of Examiners.

THE Wyoming Board of Dental Examiners will meet in Cheyenne on June 26 to 28, 1917, and all applicants holding reputable diplomas are eligible to the examinations. The examination fee of $25 must accompany the application, and be in the hands of the secretary fifteen days prior to the time set by the Board.

For further information and for blanks, address

PETER APPEL, JR., *Sec'y*,
P. O. Box 643, Cheyenne, Wyo.

California Board of Examiners.

THE next examination by the California Board of Dental Examiners for licenses to practice dentistry in that state will be held in San Francisco, beginning on the 8th day of June 1917, at 9 A.M. This examination will be followed by one in Los Angeles, beginning on the 22d day of June, 1917, at 10 A.M. All applications for examination must be filed with the board on the day set for the beginning of examination. Each application must be accompanied by (1) the fee of $25.00; (2) necessary credentials (diploma and license from other states); (3) testimonials of good moral character, and (4) a recent unmounted photograph of the applicant.

C. A. HERRICK, *Sec'y*,
133 Geary st., San Francisco, Cal.

Virginia Board of Examiners.

THE regular annual meeting of the Virginia State Dental Board, for the examination of applicants to practice dentistry in Virginia, will be held in the city of Richmond, Va., June 12, 1917.

The board will convene at the Medical College of Virginia at 9 A.M. on the date above given.

For further information address

J. P. STIFF, *Sec'y*,
Fredericksburg, Va.

Texas Board of Examiners.

THE next meeting of the Texas State Board of Dental Examiners will be held in the central high-school building, Houston, Texas, beginning Monday morning, June 18, 1917, at 9 o'clock. No diplomas exchanged; no reciprocity.

The fee of $25 should be in the hands of the secretary not later than June 13th. For further particulars and application blanks address

C. M. MCCAULEY, *Sec'y*,
840 Wilson Bldg., Dallas, Texas.

Nevada Board of Examiners.

THE next meeting of the Nevada State Board of Dental Examiners for examination of applicants who desire to practice dentistry in the State of Nevada will be held at Reno, Nev., beginning Thursday, June 7, 1917. Applications and preliminary qualifications, together with fee, must be with the secretary by June 4th.

For further information apply to

G. C. STEINMILLER, *President*,
Reno, Nev.
W. H. CAVELL, *Sec'y*,
Carson, Nev.

Wisconsin Board of Examiners.

THE Wisconsin State Board of Dental Examiners will meet to give examinations on June 20, 1917, at Berlin Arcade Hall (4th floor), cor. Third and North, Milwaukee, Wis. Applications with fees and necessary preliminary credentials must be sent to the secretary twenty days before examination.

F. A. TATE, *Sec'y.*

Massachusetts Board of Examiners.

A MEETING of the Massachusetts Board of Dental Examiners for the examination of candidates, will be held in Boston, Mass., June 22 to 30, 1917, inclusive. All applications must be in the hands of the secretary on or before June 12th.

For further information address

GEORGE H. PAYNE, *Sec'y,*
29 Commonwealth ave., Boston, Mass.

Mississippi Board of Examiners.

THE Mississippi State Board of Dental Examiners will hold its next examination in Jackson on Tuesday, June 19, 1917. Applicants for examination must be graduates of reputable dental schools, and will be required to stand a written examination in all subjects pertaining to dentistry, together with a practical examination in operative and mechanical dentistry. The examination fee is $10. For further information address

H. J. ARLEDGE, *Sec'y,*
Poplarville, Miss.

Vermont Board of Examiners.

THE next meeting of the Vermont Board of Dental Examiners for the examination of candidates to practice in Vermont, will be held at the State-house, Montpelier, commencing at 2 P.M. on June 25, 1917, and continuing for three days.

To be eligible for examinations a candidate must be (1) twenty-one years of age, (2) a graduate of a high school of the first class, and (3) of a reputable dental college.

Applications must be in the hands of the secretary not later than June 15th. For further information apply to

HARRY F. HAMILTON, *Sec'y,*
Newport, Vt.

Illinois State Dental Board.

THE Illinois State Dental Board will commence their next examination on June 15, 1917, at 9 A.M., at the Northwestern University Dental School, Chicago. Application blanks and further information can be secured from

O. H. SEIFERT, *Sec'y,*
Springfield, Ill.

Alabama Board of Examiners.

THE Board of Dental Examiners of Alabama will conduct an examination of applicants, for license to practice dentistry in Alabama, at the Birmingham Dental College, in Birmingham, beginning at ten o'clock Monday morning, June 18, 1917. All applications, accompanied by necessary fee, with proper credentials, should be in the hands of the secretary-treasurer at least one week before the examinations begin.

For further information, application blanks, etc., address

H. CLAY HASSELL, *Sec'y-Treasurer,*
Tuscaloosa, Ala.

Oklahoma Board of Examiners.

THE next regular semi-annual meeting of the Oklahoma Board of Dental Examiners will be held in Oklahoma City, Okla., at the Skirvin Hotel, beginning June 25th. Only graduates of reputable colleges presenting fifteen units credit in literary work eligible to take examination. For further information write

H. OVERBEY, *Sec'y,*
Ryan, Okla.

Maine Board of Examiners.

THE Maine Board of Dental Examiners will hold its only meeting of the year at the State Capitol, July 12, 13, and 14, 1917.

WILL S. PAYSON, *Sec'y,*
Castine, Me.

Rhode Island Board of Registration.

THE Rhode Island Board of Dental Examiners will hold its next examinations on July 5, 6, and 7, 1917, in the State-house, in Providence.

For further information address

ERNEST A. CHARBONNEL, *Sec'y,*
139 Mathewson st., Providence, R. I.

Montana Board of Examiners.

The Montana State Board of Dental Examiners will hold their next session for examination on July 9, 10, 11, 12, and 13, 1917, in Helena, Mont. Applications must be in the hands of the secretary ten days before the 1st of July.

For information, inquire of

G. A. Chevigny, *Sec'y*,
107 Clark Block, Butte, Mont.

Examination of Dentists for the U. S. Army.

The Surgeon-general of the army announces that examinations for the appointment in the Dental Corps of the Army will be held at Fort Slocum, N. Y.; Columbus Barracks, Ohio; Jefferson Barracks, Mo.; Fort Logan, Colo., and Fort McDowell, Cal., on Monday, May 7, and Monday, July 2, 1917.

Application blanks and full information concerning these examinations can be procured by addressing the Surgeon-general U. S. Army, Washington, D. C.

The essential requirements to securing an invitation are that the applicant shall be a citizen of the United States, shall be between twenty-one and thirty-two years of age, a graduate of a dental school legally authorized to confer the degree of D.D.S., and shall be of good moral character and habits.

Successful applicants will be immediately appointed—as far as the number of vacancies will permit—to the grade of first lieutenant, at an entrance salary of $2,000 per annum.

In order to perfect all necessary arrangements for the examination, applications must be in the possession of the Surgeon-general at least two weeks before the date of examination; early attention is therefore enjoined upon all intending applicants. There are at present fourteen vacancies to be filled, and on July 1, 1917, there will be twenty-two additional vacancies.

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UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING MARCH 1917.

March 6.

No. 1,218,033, to John Yirikian. Bridge attachment.

No. 1,218,078, to Isadore Goldman. Artificial tooth.

No. 1,218,178, to Rupert E. Hall. Articulator.

No. 1,218,289, to John A. Maker. Artificial denture.

No. 1,218,327, to Arthur Shorrock. Mixing-slab.

March 13.

No. 1,218,779, to Walter W. Crate. Method of manufacturing artificial teeth and other articles.

No. 1,218,989, to Leo E. Evslin. Artificial tooth.

No. 1,219,019, to Edwin R. Magnus. Artificial tooth and mounting of same.

No. 1,219,147, to Alphonse A. Picard. Toothbrush.

March 20.

No. 1,219,986, to Wm. Mark Muchow. Dental floss holder.

March 27.

No. 1,220,239, to Edward F. Klumb. Artificial tooth.

No. 1,220,252, to Austin Matthews. Dental implement.

No. 1,220,933, to Thomas F. Bates. Dental scaler.

THE

DENTAL COSMOS

VOL. LIX. JUNE 1917. No. 6.

ORIGINAL COMMUNICATIONS

Malocclusion as a Problem in Pathology.

By EDWARD C. KIRK, D.D.S., Sc.D., Philadelphia, Pa.

(Read before the Eastern Association of Graduates of the Angle School of Orthodontia, Philadelphia, March 31, 1917.)

IN presenting for your consideration the subject of malocclusion as a problem in pathology, let me confess at the outset that I do so with no little trepidation begotten of a disquieting consciousness that I am addressing a body of trained specialists who, as far as my observation goes, more than any other specialists in dental science and art have developed the habit of critically examining into the data of their specialty, and who in an intensive way are seekers after the truth underlying the phenomena with which they deal; yet, because of that very salutary habit of mind, I comfort myself with the belief that whatever of shortcomings my presentation may manifest, your criticism thereof will be constructive in character and the result therefore will be mutually helpful. And I take still further comfort in the thought that even though I should be bringing as it were a fresh invoice of scientific coals to the orthodontic Newcastle, we may, notwithstanding that fact, derive some advantage from the rehearsal of data already known to you if perchance I may be able to present these data from a different angle of view.

When the history of orthodontia comes to be finally written, should that ever be done, it is my personal conviction that the achievement which will give permanent endurance to the reputation of Edward H. Angle will be the fundamental conception upon which rests his classification of departures from normality in the positioning of the teeth composing the dentures; namely, that there is a normal form of occlusion, and that departures therefrom in the positioning of the teeth constitute malocclusion. It is the realization and promulgation of that conception which has created the science and art of orthodontia. Time and experience may possibly modify the Angle classification of malocclusion; time and experience will continue to modify the therapeutics of orthodontia as our knowledge of the etiology of malocclusion increases and as we develop a more comprehensive understanding of the relations which malocclusion bears in various ways to the general bodily economy, but it is hardly conceivable that the conception of malocclusion as a pathological departure from the physiological norm will ever be superseded as a fundamental proposition in orthodontic science.

It is, however, interesting to note that in the practical development of orthodontia, not only from the point of view of this fundamental conception of Angle's, but even previous thereto, the connotation of the terms "orthodontia" and "malocclusion"—as well as of the phrase which was their ancestral predecessor, namely, "irregularities of the teeth"—was primarily a mechanical ideal. Occlusion in its normal aspects suggests a particular arrangement of the teeth in the dentures in harmony with a definite natural type or plan; malocclusion, or irregularity of the teeth, signifies certain departures therefrom. The problem of re-alignment of the teeth or of correcting the irregularities of their position implied at once the re-arrangement of the malposed teeth into normal relationships by mechanical means. The dentures themselves when in normal occlusion were regarded as essential parts of the masticating mechanism. The functioning of this masticating mechanism was impaired, lessened in its efficiency, by malocclusion. The means by which malocclusion is overcome is a mechanical procedure—hence in its earlier stages of development the mechanical ideal dominated the practice of orthodontia to the exclusion of almost every other consideration excepting the esthetic.

Not only was the mind of the orthodontist dominated by mechanical and esthetic *motifs*, but the same factors constituted the impulse which brought orthodontia patients to the specialist in that department for treatment.

Every orthodontist, every dental practitioner, is familiar with the statement of the anxious mother who seeks the service of the dentist for the correction of her child's dental irregularities, that "Our little daughter has a very irregular set of teeth; they spoil the appearance of her mouth and mar her otherwise good looks, and I fear also that the condition of her teeth has its effect upon her health by interfering with her ability to masticate food." To all of which the dentist promptly agrees, and doubtless explains just why the mother's suspicions and anxiety are, from the professional point of view, good sound orthodox doctrine; and the case is undertaken and corrected for precisely the reasons agreed upon both by the mother and by the dental operator—the treatment being carried out wholly by mechanical means.

The conception involved in the picture thus imperfectly drawn appears to me to have been characteristic of the typical procedure in such cases during the early years of the development of the orthodontic specialty; but, like all other departments of human inquiry, the growth of orthodontia has been evolutional in character, and certain other considerations which have immensely broadened the horizon of orthodontic activity have gradually forced themselves upon us and exerted a modifying influence upon orthodontic practice and orthodontic science which promises to be little less than revolutional. The point of departure for this larger development, as I take it, has grown out of the aspect of the problem imperfectly indicated in the beginning—which by its persistent obtrusion into the field of consciousness of the orthodontic specialist came at last to receive the respectful consideration which its importance demanded.

Let us go back a moment to the incident of the anxious parent who brings her child for orthodontic treatment. Besides the primary concern of the mother as to the appearance of her child's mouth from the esthetic point of view, and her concern with respect to her child's health because of the interference which the malocclusion interposes to the proper mastication of food and the consequent malnutritional effect of her child's imperfect mastication upon its bodily health, it has doubtless been the experience of orthodontists in the majority of cases that the mother has also expressed a doubt as to whether her child was physically strong enough to endure the stress of irritation which she was led to believe the operation of correcting the malocclusion would probably entail. How often has the orthodontist been told something like this: "Doctor, our little girl is very nervous; she has only fairly good health, she is rather a delicate child, and we have been afraid to take up this matter of correcting the irregularities of her teeth because we are not sure that she is physically able to go through the strain of having the work done." There may have been a history of adenoids, of mouth-breathing, imperfect chest development, and the other stigmata of imperfect oxygenation and malnutrition so often seen in cases of this class. So that, warned beforehand, the orthodontist has progressively taken into account as a factor in the treatment of the case the necessity for so conducting his treatment as to eliminate as far as possible the nervous stress which the operation of correction would otherwise produce.

A mental review of the evolution of orthodontic appliances clearly indicates the extent to which a recognition of the need for eliminating nervous stress in the correction of malocclusions in children has been practically recognized in the construction of modern orthodontic appliances. Moreover, the researches which have been made into the physiology of tooth movement by various investigators, and particularly by Noyes and others, and the accepted doctrine that the movement of a tooth shall be kept within so-called physiological limits—that is to say, that it shall be moved no faster than the resorption of tissue upon the one side of the moving tooth is compensated for by the construction of tissue on its opposite side—is another practical recognition of the necessity for the elimination of excessive mechanical stress upon the terminals of the dental branches of the fifth cranial nerve in the investing tissues of the tooth root.

It is this latter factor—namely, the irritations of the terminals of the dental branches of the fifth cranial nerve in and about the tooth—to which I desire particularly to call your attention, and if possible shed some light upon the importance of the principle which in certain of its aspects is already recognized by the orthodontic specialist, and has led him to so conduct his operation of correcting the malocclusion in the class of cases to which I have referred that he shall not impose a further source of irritation and an increased nervous strain upon the patient whose nervous organism is already bearing a burden of nervous stress upon the same nerve terminals caused by the malocclusion itself.

From a pathological point of view, for purposes of study we may separate cases of malocclusion into two broad divisions: First, those which are in a sense accidental; and by that I mean those in which one or several teeth are in malocclusion as the result of traumatism or other local pathological causes—for example, causes which, like caries and the sequelæ of pulp infection, interfere with the shedding of the deciduous teeth, and where the retention of the deciduous teeth or roots along with inflammatory lesions of the alveolar bone leads to the malpositioning of certain teeth, which in their turn exert a retarding influence upon the eruption of one or more permanent teeth, and thus, by reason of their malposition, throw the rest of the denture out of alignment.

In the other division may be classed cases of malocclusion which, through hereditary influences affecting the general nutrition of the child, or constitutional diseases in infancy which interfere with proper development and growth of the body, cause arrest of or interference with the development of the maxillary and mandibular bones with consequent malpositioning of the dentures. It is to these latter causes that by far the largest and most important group of cases of malocclusion owe their origin, and it is the study of the etiology of this latter group of cases that has developed the largest interest and produced the most extensive literature.

The probable connection between certain types of malocclusion and certain associated stigmata of arrested development in other parts of the body, particularly of the osseous system, early attracted attention, more particularly that type of malocclusion known as the V-shaped arch and high-vaulted palate so often found in the case of the mouth-breather. The generally observed coexistence of this type of malocclusion in the habitual mouth-breather led certain observers to the conclusion that malocclusion of this type and habitual mouth-breathing were related as effect and cause.

This point of view was advocated and defended in a paper by G. Bryson Delavan(1), the eminent New York laryngologist, in 1890. Delavan contended that the atresia of the naso-pharynx by adenoid vegetations and enlarged tonsils, preventing as it did normal breathing through the nose, necessarily compelled mouth-breathing, and that the deformity of the maxillary arch resulted from lateral pressure of the cheeks with loss of the molding function of the lips, the resulting deformity of the dental arcade being brought about by the mechanical effect of the altered extrinsic forces acting upon the arch in the course of its development while the mouth was continuously kept open for breathing purposes. The following year E. S. Talbot(2) took exception to the views advanced by Delavan, and maintained that there was no necessary relation between mouth-breathing and the V-shaped arch with the high-vaulted palate.

In a clinical lecture by A. B. Marfan(3) at the Hospital for Sick Children in Paris, in 1907, the author advances the theory that adenoid vegetations and enlarged faucial tonsils and the deformity of the maxillary arch have a common origin in a constitutional manifestation of rickets. Marfan's paper is one which has not received the consideration to which its importance entitles it, and I therefore feel justified in quoting somewhat extensively from it because of its bearing upon the problem of the etiology of the particular type of malocclusion here under discussion.

In reviewing the ideas which had been advanced up to that time explanatory of the etiology of the V-shaped arch and high-vaulted palate, the author states that Meyer in 1874 announced that adenoid tumors of the naso-pharynx are accompanied by characteristic deformities of the maxillary region, open mouth, prominence of the upper central incisors, V-shaped palatal arch, teeth crowded together and overlapping, small (atrophied) nose. All these characters Meyer believed to be dependent upon the naso-pharyngeal stenosis, which, causing increasing difficulty in nasal respiration, induced a correlative necessity to respire through the mouth.

David(4) in 1883 maintained that the conditions described by Meyer so far as they related to the mouth deformity were without exception due to naso-pharyngeal stenosis. As opposed to this mechanical theory, Marfan notes among French authors Balme, Alkan, Barth, Gourc, and especially Neveu(5), and says: "It is by no means rare to find normal palatal vaults in subjects with large adenoid vegetations," reporting his own particular observation of forty-seven cases of V-shaped arch, among which twelve had no tonsillar or adenoid hypertrophy. He also emphasizes the fact that removal of the tonsils and adenoids has no appreciable effect in correcting the deformity of the palatal arch. He further cites the observations of Fleischmann(6) in 1877, and Fonsagrives(7) in 1882, on the characteristic changes in the maxillary and palatal vault in cases of rickets, and says:

> However, the attention given to adenoid vegetations caused these indications to be forgotten, but the rôle of rickets in the formation of the V-shaped arch *(voûte palatine en ogive)* appeared to me to be undeniable, so that in 1896 I wrote as follows: The coexistence of adenoid vegetations and rickets is the most powerful factor in the causation (genesis) of malformations of the superior maxilla.(8)

M. F. Regnault(9) in the same year (1896), from a study of old rhachitic skeletons, without explicitly mentioning the V-shaped palatal vault, described the malformations of the maxilla which to us appear to be identified with them. Now, I think we can affirm that rickets is the true cause of the V-shaped palatal arch. In 47 cases of this deformity in young subjects, 37 had skeletal defects which beyond doubt were associated with the existence, past or present, of rickets. In the remaining ten subjects who had almost passed the phase of activity of rickets, in the absence of deformities considered characteristic, certain reminders (*anamnestiques*) rendered very probable the previous existence of that malady, *e.g.* retardation and irregular eruption of the teeth, very late walking, artificial suckling, dyspeptic troubles with enlarged abdomen during early infancy.

There is a congenital rickets(10) but it is extremely rare. Rickets is not very often seen in the early months of life. In general it is between the ages of six months and one year that the first indications of the malady appear. When its progress is not arrested by proper hygiene and suitable treatment it may continue during the second, third, and fourth years, and it is during the two latter years that the deformities attain their highest degree. After four years the disease gets well or enters upon a period of repose. The malformations that are not very strongly pronounced disappear more or less rapidly; the others remain permanently. The phase of repose endures until the approach of puberty, then the disease may begin a new evolution under the special form of delayed rickets, which does not arrest itself until the process of ossification is finally completed.

In a hundred cases of infants under six months I have never seen a V-shaped palatal deformity. In an infant of seven months slightly rhachitic, having two teeth and large adenoid vegetations, the beginning of the V-shaped arch was noted. The palatal vault was narrower and somewhat higher than in normal infants of the same age. It is only after the age of two and one-half years that cases of V-shaped arch are easily found—that is to say, at the epoch where rickets, the development of which has not been arrested by hygiene and treatment, arrives at its climax—the epoch of greatest malformations. According to my observations, V-shaped arch develops very rarely after the fourth year, when the period of rhachitic activity has terminated.

There is a close parallelism between the evolution of rickets and the V-shaped arch. Both develop at the same time. It is undoubtedly rickets that engenders the V-shaped arch. Rickets softens and deforms the bones. It strikes especially those parts of the skeleton in which ossification is most active. It is natural that it should attack the superior maxilla, in which, at the period of life when rickets develops, the process of dentition is associated with intense nutritive changes. It is reasonable to suppose that the attack made on the superior maxilla by rickets is profound, since the V-shaped deformity once produced is quite definite. I have observed for a long time a certain number of subjects which present the V-shaped arch, and I have not seen a case where it was modified even after removal of adenoids or tonsils. Neither the growth of the osseous system up to puberty nor the evolution of the dentures appears to modify the form of the V-shaped arch; rather it seems to become more pronounced. Is it due to a return of rickets (delayed rickets) or because atrophied by infantile rickets, that the superior maxilla is retarded and incapable of following its integral development and will always remain atrophied, no longer offering a sufficient area for the evolution of the teeth, and thus giving rise to their abnormal arrangement? Does the loss of the teeth tend to modify or cause the disappearance of the V-shaped arch following the atrophy of the alveolar border? However that may be, the V-shaped arch once produced may be considered as fixed and definite. When it is very severe and alters the esthetic appearance of the face, recourse may be had to dental corrective treatment—which, however, alters the direction of the teeth, but does not modify the palatal arch; this remains as a definite stigma of past rickets, and constitutes one of the best signs in the retrospective diagnosis of these maladies.

The author eliminates by the process of exclusion the other sources of malnutrition, *e.g.* syphilis, lymphatism, scrofula, etc., excepting in so far as syphilis, for example, may be one of the causes of rickets, and says further that rickets is not a disease of the bones, but a malady of which the adenoids and tonsillar hypertrophy are a part.

At the conclusion of his interesting and highly suggestive paper Marfan reviews the observations of various writers, prominent among whom is Hertoghe(19) of Antwerp, who advances the suggestion, based upon clinical study of cases, that the osseous deformities of rickets, and the tonsillar and adenoid hypertrophy which they also regard as stigmata of the same general constitutional malady, are manifestations of hypothyroidism—a point of view which Marfan unqualifiedly and almost dogmatically rejects.

Curiously enough, Leonard Williams(11), M.D., physician to the French Hospital and associate physician to the Metropolitan Hospital of London, inspired by the suggestiveness of Marfan's paper from which I have so largely quoted, under the mistaken impression that Marfan is an advocate of the theory of hypothyroidism as the causative factor in rickets, sets forth some important and interesting observations on the subject which tend to justify from clinical observation the conclusions of Hertoghe and his colleagues, which Marfan rejects. Williams says:

> That the thyroid secretion is essential to the development of the fetus is shown by several facts. Myxedematous women seldom become pregnant, and when they do, in the absence of thyroid medication they invariably abort. It is normal for women during pregnancy to develop an enlargement of the thyroid gland, which subsides rapidly after the child is born. By no means the least important function of the thyroid gland is that of fixing the calcium salts in the body. In order to permit of bone formation in the fetus, the mother is obliged to provide more secretion than under normal circumstances she requires, and the gland consequently hypertrophies. After the birth of the child the increment being no longer necessary, the gland resumes its usual proportions. In some women this prolonged call of pregnancy has the effect of unduly exhausting the gland, and they are unable in consequence to suckle the child, for lactation is dependent upon a due supply of thyroid secretion. Such women generally become obese and lethargic, and remain so for varying periods until the thyroid has had time to recover itself. Judicious thyroid medication will frequently not only enable a mother to suckle her infant, but will materially shorten the period of her post-partum difficulties.
>
> Now, with regard to rickets I feel in a position positively to affirm that if all the symptoms of the disease are not due to thyroid insufficiency, then certainly its most salient features are. Especially does this apply to the bony phenomena which characterize its outward seeming. These phenomena are obviously due to inadequate osseous development, and as in the fetus so in the growing infant, thyroid secretion is essential to the full utilization of the calcium salts. It is known that the bony phenomena are due to a relative absence of calcium salts, and it is also known that these salts, given in large excess though they be, have no influence in arresting the disease. This is because the all-essential link is missing, the thyroid secretion, by whose means alone the ingested calcium can be so assimilated as to be incorporated in the osseous tissues. I claim no originality for this view as to the essential factor in rickets. It was first advanced by Professor Marfan in 1907, and upheld in an interesting paper which does not appear to have attracted the attention which it deserves. My own experiences have convinced me that this view is correct. If it be true anywhere, as the adage has it, that *Naturam morborum curationes ostendunt*, it is pre-eminently true in the sphere of opotherapy, and every case of rickets in which I have employed thyroid extract has shown such decided improvement as to leave no doubt in my mind that thyroid insufficiency is the main causative factor in the disease.
>
> As a child progresses in years, deficiency in thyroid secretion may reveal itself in various ways. I have already shown that nocturnal enuresis, though it may own other causes, such as phimosis or intestinal worms, is, in the vast majority of cases, caused by thyroid inadequacy and is readily curable by the administration of thyroid extract. In the same connection I discussed the question of adenoids, and made so bold as to suggest, concerning them, that they constitute one of the stigmata of thyroid insufficiency. It is not my present purpose to enter further into the question, except to state that a more extended experience confirms me in the views which I then rather tentatively expressed. These may be briefly summarized as follows: Adenoids and enlarged tonsils occur in children who have an inadequate supply of thyroid secretion. The hypertrophic condition in each case is apparently the result of an endeavor on the part of the organism to supply an internal secretion as nearly allied as possible to the one which is lacking. If the hypertrophy is not very pronounced, and if it has not been very long in existence—great enough and protracted enough, that is, to produce complications, such as disease in the tonsils themselves or in the ears—then the

> exhibition of thyroid extract will cause their regression. It is only when medical means have failed that operative interference becomes justifiable.

These views regarding the malnutritional sequelæ of thyroid insufficiency as set forth by Leonard Williams form the inspirational *motif* of a publication by Herbert Ewan Waller(¹²), M.R.C.S., M.R.C.P., of Birmingham, England, whose book, considered in the light of more recent investigations as to the specific functions of the thyroid and parathyroid secretions, presents some points of criticism as to its scientific accuracy, but is nevertheless an interesting and valuable contribution to the literature of the subject from the standpoint of clinical observation—particularly so as Waller's observations as to tonsillar and adenoid hypertrophy are strongly corroborative of the conclusions of Leonard Williams upon that point.

It would seem from the observations of the authors quoted that the deformation of the maxillary arch, or at least that particular deformation which we know as the V-shaped arch, the *voûte palatine en ogive* of the French, is primarily due to the arrest of development of the maxillary bones, which arrest of development is due to impairment of the normal process of bone calcification, and that this interference with osseous calcification is related to insufficiency of thyroid activity.

The researches undertaken since the period (1907) when the conclusions which I have cited were published seem to indicate that the process of bone calcification is controlled more particularly by the hormone of the parathyroids rather than of the thyroid gland. Erdheim(¹³) reports that in his experiments upon parathyroidectomized rats—

> The animals survived from 54 to 162 days, and invariably showed changes in the teeth. Between the sixth and tenth weeks, opaque white spots appear upon the enamel of the anterior surfaces of the upper and lower incisors, and these move upward from the base to the apex. These spots are circumscribed defects in the enamel, which may scale off and cause the tooth to break. The upper incisors grow quickly after fracture, but the fracture of the lower ones is frequently followed by necrosing ulcers. As the changes in the teeth prevent the animal from taking a sufficiency of nourishment, extreme inanition and cachexia follow. Histological examination of the teeth shows that the trophic disturbances appear very soon after removal of the parathyroids, and that they result from imperfect calcification of the dentin, together with hypoplasia of the enamel. . . .
>
> Fleischmann(¹⁴) found that the teeth of all the persons he examined who had a history of infantile tetany showed hypoplasia of the enamel. Escherich concluded from these results that all forms of infantile tetany are due to parathyroid insufficiency. . . . Further experiment showed that the arrest of growth was due to a remarkable retardation of the process of ossification, both of the epiphyses and of the synchondroses. . . .
>
> In goats, operated on three weeks after birth, the same author was able to observe a difference in growth in comparison with the control animal as early as one month after operation. At the end of four months, the thyroidectomized goat was half the weight of the control animal. In addition to shortening of the bones of the extremities, there was marked shortening of the frontal part of the head, the occipital part appearing exaggerated by comparison.

These observations tend to confirm the views of Hertoghe(¹⁹) which were rejected by Marfan(³) and are supported by the clinical observations of Leonard Williams(¹¹).

Thus far there appears to be ample justification for the view that the primary cause of the V-shaped palatal deformity is a retardation of maxillary development induced by insufficiency of thyroid or parathyroid activity. We are, however, still confronted with the possible rôle which stenosis of the nasopharyngeal space resulting from retarded development of the osseous structures, and the adenoid and tonsillar hypertrophy, may play in the increase of the deformity by compelling habitual mouth-breathing and thus introducing extrinsic mechanical forces as factors in the problem of palatal deformity.

That the foregoing conditions may play such a rôle, and in no inconsiderable degree, appears to have been demonstrated by the researches of Baker(¹⁵), Bebb(¹⁶), and G. V. I. Brown(¹⁷), who have experimentally produced deformities of the palatal arch by permanently closing the nasal respiratory tract upon one side in young animals—rabbits, guinea-pigs, etc. The importance of this mechanical factor of nasal stenosis and mouth-breathing cannot be by any means ignored, but in the light of the observations of the French authors whom I have quoted, the mechanical factor cannot be regarded as the sole cause of the deformity, but rather as a secondary or succedaneous factor superinduced by the original constitutional nutritional fault which originated the primary arrest of osseous development.

If these views of the etiological factors responsible for the production of the V-shaped palatal defect be correct, then it would seem that those who, like Meyer, David, and Delavan, have advanced the nasal stenosis and mouth-breathing theory, and those who, like Marfan, Hertoghe, Williams, and others, have given prominence to the theory of arrested development from imperfect ossification as the result of hypothyroidism, have both seen the truth, but each only in part.

I wish now to discuss briefly some of the sequelæ of the dental deformity here under consideration from the point of view of its nervous relations.. In the beginning of this paper I directed your attention to the anxiety so often expressed by the parent, when consulting the orthodontist with reference to the correction of these deformities, lest the nervous stress which it was feared that the corrective treatment might entail would overcome the nervous and physical endurance of the child.

My attention has for some time been focused on the coexistence of a variety of nervous pathological phenomena with dental malocclusions which in a large number of cases have been under observation and investigation by members of the Henry S. Upson Commission, and which investigation will in the near future be embodied in a report by the commission, and I therefore am not justified in more than referring to it in general terms at this time, but I may say this much, that there is now before the commission an accumulation of data which furnishes incontestable evidence that a large group of reflex pathological nervous phenomena have their immediate origin in the prolonged, and I may say continuous, slight physical irritations of the terminals of the dental branches of the fifth cranial nerve in and about the teeth and their investitures.

I have elsewhere(¹⁸) discussed the broad range of clinical expressions of these dental reflexes arising from physical irritation of the dental nerve terminals, but what I wish to more particularly bring out at this time is the development and increasing intensity of these nervous reflexes which progress synchronously with irregular evolution of the dentitional process in the cases of V-shaped palatal arches in children.

Let me cite the records of a typical case: *Miss E. F.* Will be fifteen years of age on April 22d. American-born, Russian-Hebrew parentage. She is the second child of her parents, and was born two years and three months after the birth of the preceding child. The mother states that E. was an irritable, nervous, "cranky" child; cried much at night. Erupted her upper central incisor teeth at eleven months. The mother does not remember when the primary dentition was completed. The child was nursed and not weaned until eighteen months old. Began the addition of some artificial feeding as early as six weeks; the baby was given zwieback, bread, some milk, etc., between nursings. At about three months of age she was vaccinated, at which time and while the arm was still sore but after the height of the reaction from the vaccination, the child suffered from a succession of convulsions from midday until the midnight following. The vaccination was closely followed by an attack of measles. The physician claimed that blood poisoning resulted from the vaccination. He reached this conclusion on account of the severity of the reaction, the convulsions, and the inflammation. Five years later E. again had convulsions. During the second attack of convulsions the seizures lasted from 9 until 12 o'clock in the morning. In the intervening period, however, she was quite normal in all respects. The mother noticed about two weeks after the second attack of convulsions a tendency to twitching of the eyelids, mostly on the left side. She consulted the physician with reference to the twitching of the eyelids and the doctor suggested that it might be due to "indigestion or worms," and at the same time suggested the removal of the tonsils and adenoids, which was done nine or ten months later, at about the age of six years. Following the removal of the tonsils the child developed a twitching of the left side of the face and mouth, with a twitching and rapid flexing of the left arm leading to an involuntary tapping of the hand on the sternum caused by the spasmodic contraction of the arm muscles. This was at the age of six years and three months.

At about seven years the convulsive seizures returned while at school, and while of distinctly epileptic form in character, they were of slight duration and never caused her to fall. The seizures continued with a fair degree of regularity and intensity at intervals of two or three weeks, the intervals gradually growing less and the intensity of the seizures gradually increasing until at about ten years of age they were of such intensity that the patient would fall during convulsions. The seizures beginning four years ago occurred at intervals of a week or five or six days, and for the past two years have occurred practically daily, but occasionally with intervals of two or three days, and then three or four seizures daily. The menstrual periods were established at about twelve years of age.

The patient is not a typical mouth-breather, nor has she a typical V-shaped palatal deformity. There is, however, a narrowing of the nasal respiratory tract with corresponding tendency to mouth-breathing at times, and there is slight narrowing of the palatal arch with slight elevation of the palatal vault. The second bicuspid of the right side is in marked lingual occlusion. The deciduous canine of the left side is retained, and a radiograph of the left upper canine region shows impaction of the permanent canine, high up and resting at an angle of 45 degrees to the roots of the lateral incisor and first bicuspid. The radiograph also shows tendency to impaction of the third molars.

In view of the serious character of her nervous difficulty, removal of the deciduous canine and the impacted successor, together with the impacted second bicuspid, was decided upon and done. The patient has shown some improvement since the operation, but not marked improvement, the probability being that there is still reflex disturbance from the impacted third molars, which supposition is amply sustained by our experience with reference to a considerable number of other epileptic cases, whose nervous disorder has been markedly relieved by the removal of the third molars when they have shown evidences of impaction in patients as young as fourteen years of age.

I have reported this case somewhat at length in order to call your attention to the progressive development of the nervous trouble in connection with the symptoms of arrested osseous development beginning often as far back as delayed eruption of the deciduous incisors at eleven months, when they should have made their appearance at seven months of age; also the coincident tonsillar and adenoid hypertrophy. This child will be placed upon thyroid extract with calcium iodid as a physiological test, in the hope of determining whether there is an underlying factor of thyroid insufficiency, which from the clinical history seems to be strongly indicated in this case.

The record of the foregoing case is one which is fairly representative of a considerable number of cases that have come to the attention of the Upson Commission, cases which in their totality strongly point to the conclusion that the malocclusion which results from the underlying state of malnutrition causing arrest of osseous development in the maxillary and mandibular bones, entails not only characteristic malpositioning of the teeth in the dental arches, but that this malpositioning of the teeth is in its turn productive of physical irritation to the terminals of the dental branches of the fifth cranial nerve, which irritation becomes in time the exciting factor in the production of nervous reflexes that under favorable conditions may and do develop into nervous disorders of the most profound and serious character—nervous disorders which, like chorea and epilepsy, when their immediate exciting cause is as herein set forth, may be greatly relieved and in certain cases permanently cured by the removal of the causes of terminal dental irritation.

If further research and clinical observation should definitely justify an affirmative conclusion as to the etiology of this class of dental nervous reflexes, then it would seem to be logical and clearly evident that we must regard this group of malocclusions not simply as aberrations from normality in the masticating mechanism, nor as deformities which interfere with esthetic standards, but as cases of generalized impaction of the teeth with the potentialities for harm, in the way of reflex disturbances, interferences with nutrition and the mental and physical efficiency of the individual, which we already know can arise from that more limited class of interferences with dentition which we speak of specifically as impacted teeth.

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[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

Report of a Case of Composite Odontoma.

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THE subject of this report is a case of odontoma of the mandible which presented features of interest in the size of the tumor and the method adopted for its removal.

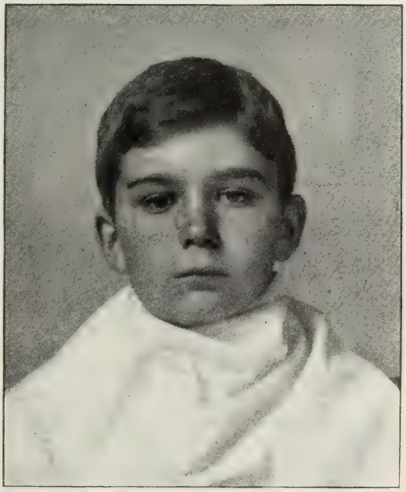
The patient, a boy, eleven and one-half years of age, came to the Forsyth Dental Infirmary for Children with the following history: When about seven years of age a very slight enlargement of the mandible on the right side, extending from the angle forward, was noticed by his parents. The mother had remarked that no teeth had erupted on this side as on the left side of the jaw, and this condition prompted her to take the boy to a dentist. She was advised not to worry about the absent teeth, as they would erupt in due time. This explanation was accepted as sufficient, as the boy had never complained in any way.

The enlargement became more noticeable, yet a year elapsed before another visit was made to the dentist. Two additional visits were made in as many years, the second being occasioned by the exfoliation of a deciduous molar, which event was welcomed as a good omen that the long-delayed teeth were erupting.

No teeth erupted within the next few months, however, and now the boy began to complain of occasional pain on the affected side, it being a dull ache lasting a day at a time and then completely subsiding.

The pains continued to grow more and more frequent in the fall of 1915, when the boy's parents, becoming alarmed, consulted their family physician, and were referred by him to another dentist, who in turn referred the case to the Infirmary.

FIG. 1.



Examination. Boy, eleven years of age. Well nourished, normal weight and height. General physical examination negative, excepting an enlargement of the mandible, right side, extending from the angle of the jaw to the region of the canine. (See Fig. 1.) Mouth very clean, but a very evident lack of room for a tongue of normal size, the tongue being deflected to the left side. There were no teeth present on the affected side distal to the deciduous canine, and this was noticeably loose. All the other teeth were normally erupted.

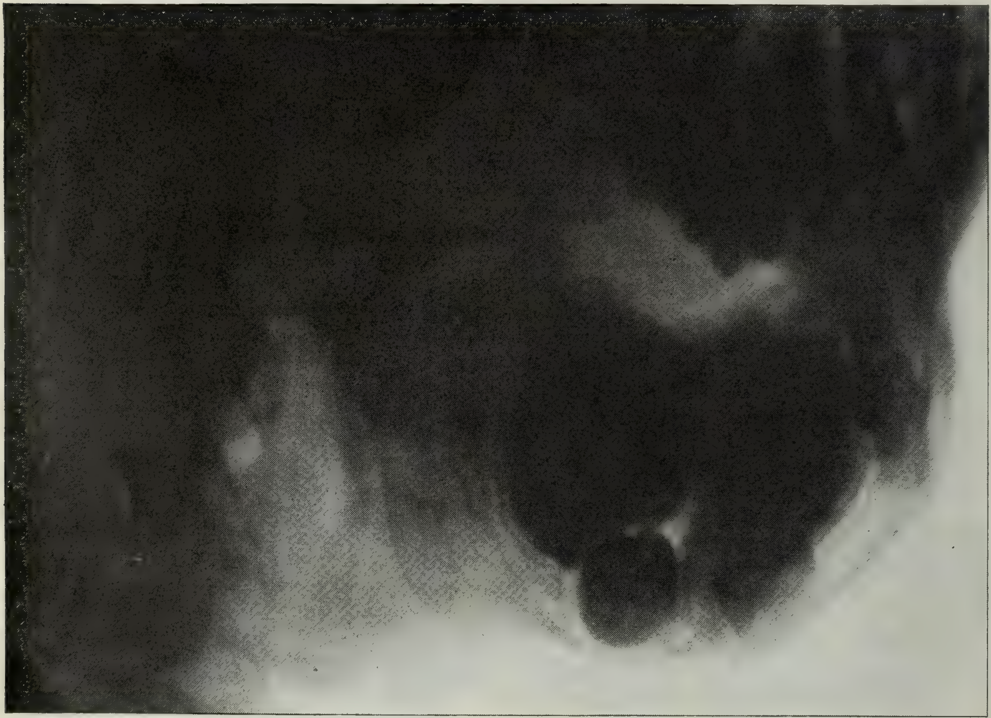
A marked bulging of the alveolar plates was present on the right side, presenting, instead of a ridge, a broad crest fully one inch in width, with the buccal surface more bulging than the lingual.

Digital examination with the exertion of excessive pressure occasioned not the slightest tenderness, nor any resilience, but rather the feel of solid bone.

A radiograph was ordered made (see Fig. 2), after which an exploratory examination was made under novocain anesthesia, blocking the inferior dental nerve. With the surgical engine and chisel a good-sized piece of the tumor was removed. A section made from this was examined, and a diagnosis was given of "composite odontoma."

Operation. Under ether anesthesia maintained for one hour through the nose, an incision approximately 2½ inches long was made from the region of the angle of the jaw to the canine tooth intra-orally. The mucous membrane and periosteum were dissected back from their attachments buccally and lingually. With chisel and mallet, the bone directly over the tumor was removed, disclosing the entire mass beneath, encapsulated in its bony shell. The buccal plate being the thinner one, this was carefully chiseled away piece by piece until the entire buccal aspect of the tumor was uncovered. The floor of the bony shell, if we may be permittted so to call the lower border of the mandible, proved to be as thin as a sheet of paper in places, and ranged in thickness up to one-sixteenth of an inch—which fact made extra care

Fig. 2.



in operating necessary, if fracture were to be avoided. With the upper and entire buccal bone plate removed, pressure with an elevator distally and lingually to the mass in an upward direction quickly shelled out the larger of the two masses from its fibrous adhesion to the bottom of the bony shell. The smaller mass was removed in like manner. (See Fig. 3.)

The tumor had developed in two masses, the smaller (Fig. 3, *B*) being perfectly faceted with the larger. Directly beneath the masses were the canine (Fig. 3, IV) and the two molars, which were loose in a bed of fibrous tissue. (See Fig. 3, II and III.) The canine on the left (see Fig. 3, I) was the loose deciduous canine which was dislodged when the mass (see Fig. 3, *A*) was lifted from its bed.

The size of the cavity after the tumor and teeth had been removed can best be imagined from the following measurements of the tumor: From before backward, two inches; from side to side, fifteen-sixteenths of an inch; from above downward one and three-sixteenths of an inch. Weight, 360 grains.

The germs of the permanent bicuspids were undoubtedly responsible for the tumor in this case.

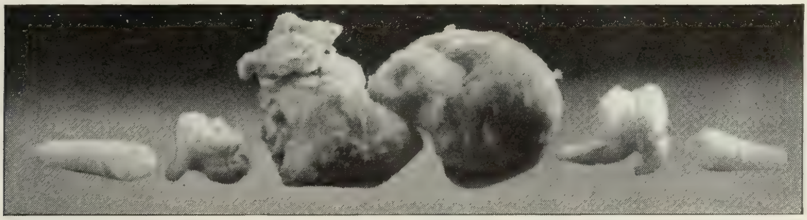
ETIOLOGY OF ODONTOMATA.

Odontomata have as their etiology some or all portions of teeth during embryonic development. They differ from impactions in that the tooth or teeth do not properly develop, and some portion of the histological structure forms the nucleus of a new growth.

The composite odontoma is made up of enamel, dentin, and cementum. These elements may be fused together in a more or less homogeneous mass, containing well-formed diminutive teeth, or may appear only as a conglomerate mass with composite (whole tooth germ).

The classification of developmental neoplasms as given by Bland-Sutton twenty years ago has not been changed. The literature on the subject is not extensive. Sutton's classification of odontomata is as follows: (1) Epithelial (enamel organ); (2) follicular (fibrous cementous); (3) radicular (root); (4) composite (whole tooth germ).

FIG. 3.



EPITHELIAL ORGAN TUMORS.

Epithelial organ tumors give rise to clinical epithelial cysts. These are usually multilocular, filled with mucus, and have a red cyst wall so thickened as to superficially resemble sarcoma. They may appear at any age, but are most commonly seen between the ages of eighteen and twenty-three years. The most probable theory of their etiology is that they are persistent remains of epithelium of the original enamel organ.

FOLLICULAR ODONTOMATA.

According to Sutton, this variety of tooth tumor occurs in three forms, which present very much the same gross characteristics. These are the typical so-called "dentigerous cysts." They develop from permanent teeth, usually from molars. The wall is formed by the expanded tooth follicle. The cyst is filled with a viscid fluid, within which is found the imperfectly developed loose and displaced tooth. These tumors may grow to enormous size, producing great deformity. This variety is known as *fibrous.* The sac wall usually calcifies. The cementum of the tooth has to do with the change just mentioned, hence the name sometimes used, "cementoma."

Two or more follicles may join in the process, when it becomes known as "compound follicular odontoma." Dozens of tooth-like bodies have been removed from such cavities. Suppuration rarely if ever occurs.

CEMENTAL FOLLICULAR ODONTOMATA.

Certain tooth tumors have the same consistence as the tooth, and may be a simple budding from the side of a tooth, from either the root or the crown, or the cemental growth may include the entire tooth, with the crown exposed at only a single point by which it may be identified with a particular tooth.

They differ from the follicular type in that the crown of the tooth does not enter into the growth, the tumorous mass being made up of dentin and cementum in varying proportions. The tooth erupts, but soon loses its identity in the tumor arising from its base. This type of tumor is rare in man.

The composite odontoma differs from the first three varieties mentioned in Sutton's classification in that there is no cyst wall or cyst fluid. While the tissue from which they originate has not been definitely determined, it is attributed to the remains of the epithelial cord which have failed to atrophy, or to extra buds given off from the epithelial lamina that have become distorted during development.

DIAGNOSIS.

Diagnosis of odontomata is very important. No growth in the alveolus before maturity should be removed before we have excluded odontoma.

A frequent error of the general surgeon who does not see many dentigerous cysts and who is on the lookout for malignant growths, is to completely remove the maxilla or half of the mandible, only to find, after operation, that a single tooth or several teeth were responsible for the growth, which is benign. The wide excisions indicated for the complete removal of malignant tumors are never justified in cases of odontomata.

I desire to emphasize the absolute necessity of a differential diagnosis between tooth and bone cysts, osteoma, exostosis, sarcoma, carcinoma, actinomycosis, and the swelling associated with chronic bone diseases, such as tuberculosis and syphilitic gumma, and to enter a plea for the removal of tooth tumors by the intra-oral route and not by extra-oral approach.

In differential diagnosis it is obvious that an accurate and correct diagnosis must precede the treatment of diseases in which the forms of treatment indicated differ so widely. The following classes are to be borne in mind:

(1) Benign tumors and those of slight malignancy, requiring simple removal.

(2) Malignant tumors in which a radical operation, with wide excision of surrounding tissues and lymphatics, is imperative.

(3) Systemic infection, viz, syphilis.

(4) Local infections, viz, actinomycosis and ordinary bacterial infections.

168 Newbury st.

A Study of the Relation of Dental Conditions, Biting Force, and the Hand-Grip.

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AND

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(Read before the Eastern Association of Graduates of the Angle School of Orthodontia, Springfield, Mass., January 27, 1917.)

THERE is a tendency at the present time to limit the scope of orthodontia. Moving teeth to a normal occlusion seems sufficient to many operators; when this has been accomplished and the mutual mechanical relations of the teeth established, it is assumed that the work of the orthodontist ends. It is apparently of no concern whether the teeth remain in such a normal occlusion, for once it has been established they are freed of appliances and left to the mercy of forces as positive as those of any mechanical device, and of continuous duration. Diagnosis and treatment are very closely confined to structural conditions typified in the plaster models. The models are thought to be representative of an entity whose ultimate form can be definitely determined by the application of artificial force for a comparatively short period of time. Early in the development of the art, when all effort was directed to the building of appliances and study was limited to the tissues most directly involved in tooth movement, such a conception was logical; today, however, it has no place in scientific thought except as being of historic interest.

Tooth movement is but a part of a scientific problem. Although it will always occupy a large place in practice and make indispensable appliances that can be operated in accordance with the biological requirements of the supporting tissues of the teeth, the relative value of the operation must be realized. A large number of the treated cases illustrated in the literature are photographs of models made very soon after appliances have been removed. They do not represent a natural condition. This can only be shown by models made at least a year after all treatment has been discontinued: then the occlusion will have been under the influence of the natural forces long enough to express their equilibria and manifest the real effect of treatment. Thus it is the degree in which normal occlusion is maintained by the natural forces of cell metabolism and function, after all appliances have been removed, that defines the value of treatment. To bring the teeth into normal occlusion by the stimulus of artificial force is one thing, to make them stay there is quite another problem, and in its solution lies the future of orthodontia.

IMPORTANCE OF STUDYING THE RELATION OF MALOCCLUSION TO THE ORGANISM AS A WHOLE.

The nature of occlusion can only be understood when studied as a part of the organism. The significance of malocclusion can only be appreciated from a knowledge of the way in which it affects and is affected by the organism as a whole. This has been very clearly expressed and brought home to orthodontia by Dr. George E. Dawson* in a paper entitled "Atypical Development in the Light of Correlative Variation," presented before this society last year, in which he says: "The scientific student of structural and functional variations in human beings, whether under their normal or their pathological aspects, should not fix his attention exclusively upon isolated organs and functions. Every organ and every function that organ performs are parts of a complex of structures and functions, and can be understood, correlated, or trained only in connection with all the rest." Baldwin, in his "Mental Development of the Child and the Race," in emphasizing the necessity of considering psychical as well as physical phenomena says, "—to avoid the danger of interpreting one kind of existence for itself, in an isolated way, without due regard to other kinds of existence with which its manifestations are mixed up."

The evidence of science is explicit that occlusion must be considered as a mutually dependent and essential part of the individual; that it is controlled in its growth and development by the same factors which control the growth and development of the organism as a whole, and that it is expressive of both physical and psychical phenomena. Therefore diagnosis and treatment in orthodontia must be equally comprehensive. Since the ideal of treatment is to influence the natural forces expressed in malocclusion, the development of the art is dependent upon investigations which reveal the nature of these forces. The character of such investigations involves the means and methods of collateral sciences, and it is only in correlating the results of research from various angles that data of value can be drawn. With the increase of knowledge from studies such as these, orthodontia will occupy a more definite place among the sciences of human conservation.

The following is the report of a study of the correlation of dental conditions to the greatest force exerted in biting upon the first permanent molars and the strength of the hand-grips. The material of this investigation can serve only as an introductory study, indicating certain general tendencies. Research in this field has been recorded by Dr. Black in his "System of Operative Dentistry," but clinical observations have so persistently challenged his conclusions that further investigation seemed necessary and pertinent to the progressive tendency of orthodontia expressed above.

Referring to the evidence of the gnathodynamometer, Dr. Black says:

> There were tabulated the results in one thousand persons, and the average force exerted was 171 pounds on the molar teeth, and considerably less on bicuspids and incisors. In this there was no selection of persons further than a careful exclusion from the trials of persons whose teeth were so badly weakened by caries as to cause danger of injury by breakage.
>
> Nearly everyone who makes a trial of his bite on the gnathodynamometer stops because of pain in the peridental membrane rather than from having reached the full limit of muscular effort. Therefore the limitations of the force of occlusion as shown by the gnathodynamometer is a register of the power of resistance by the peridental membrane, and not a register of possible muscular exertion.

Although the work by Black was not conducted in the same way as the investigation here reported, there are enough points in common to make the different results quite significant.

MANNER IN WHICH TESTS OF BITING FORCE AND HAND-GRIPS WERE MADE.

The test of the hand-grip was made with the Smedley improved dynamometer. (Fig. 1.) The subject, standing, gripped the instrument as hard as possible first with the right, then with the left hand, and the pounds pressure was recorded in each case.

The greatest possible force exerted in biting upon the first permanent molars was ascertained by the use of the gnathodynamometer shown in Fig. 2. The subject, seated in an ordinary straight-backed chair, was asked to bite as hard as possible upon the gutta-percha pads covering the ends of the steel levers at A. The gutta-percha pads are removable (Fig. 2, B); a new set is used for each test. The amount of pressure exerted is registered in pounds at the gage C. The instrument reads accurately to 120 pounds. The observations of Dr. Black would seem to prohibit the usefulness of an instrument with such a limited pressure registration, but the range has been adequate for the purpose of this investigation.

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* See DENTAL COSMOS for February 1917, p. 171.

Fig. 1.

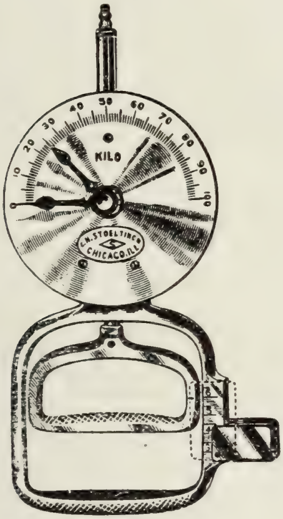
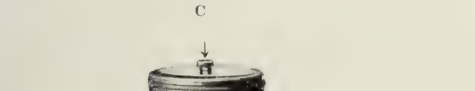


Fig. 2.



The records were classified according to sex, age, and with reference to dental conditions, into two classes, normal and abnormal.

The normal division included those cases in which all of the teeth were present in normal mesio-distal relation and in occlusal contact. They were normal in structure and normal in functional relations. In biological research the line is not always distinct between the normal and abnormal, so in those cases with slight structural variations the classification was determined with regard to the influence such structural variation might have on function. In this way a few cases were classed as normal which if considered from the standpoint of structural relations alone would be designated as class I (Angle) malocclusion. They were those cases with slightly crowded lower incisors.

The abnormal division included all cases of malocclusion, carious and mutilated dentures, and those with congenitally missing teeth; in fact, all cases with structural conditions which might in any way interfere with the freedom of function were classed as abnormal. In this class were included a number of cases with loosened deciduous and partially erupted permanent teeth. Although these latter conditions are typical of normal development, they do interfere, for the time being, with the normal action of the jaws; thus, since chronological age and not physiological age was the basis of our averages, it seemed best to classify many such cases in this division.

Over 800 sets of tests have been recorded. Among these there are none of subjects designated as feeble-minded or of low mentality; also, in so far as it was possible to ascertain, in the limited time at our disposal with each subject, all cases were excluded in which a pathological condition of the tissues in the first molar region or a lowered vitality of the subject as a result of disease made it impossible to secure a probable index of full biting force. In a large majority of all subjects tested, especially those with normal jaws, the discomfort under maximal pressure was referred to the temporo-mandibular articulation rather than to the peridental membrane. The different attitudes of the subjects to the biting tests was very marked. Those who had experienced pain in the teeth as the result of caries or dental work and those with pronounced malocclusion approached the test with caution, but those with normal tooth structure and normal occlusion took the tests rather eagerly, biting to the limit of their power with fearlessness and precision. The pressure exerted by subjects with normal dentures is often considerably lower or higher than the average for the age, but the difference between the pressure exerted on the right and left sides of the same subject is very slight—in fact, in most instances they register alike, while subjects with abnormal dentures show a wide variation between the pressure exerted on the two sides.

Although individual records are interesting, they are rather obscure and unintelligible in the mass, and therefore they have been systematized by condensing to two representative values, namely, the average and standard deviation.

The average is merely a measure of general tendency and nothing more. Whipple, in his "Manual of Mental and Physical Tests," says that the average "gives no indication of the distribution of individual records from which it is obtained; no indication of the extent to which these measures vary or deviate from the average; no information as to how homogeneous is the material that the average represents. If five individuals weigh 80, 65, 60, 55, and 40 kg. respectively, and five others 62, 61, 60, 59 and 58 kg. respectively, the average weight of either group is 60 kg., but one group is distributed very closely around the average, whereas the other group exhibits such marked deviation from it that the average has little significance as a representative value. From this it follows that we need not only measures of general tendency but also measures of variability, the tendency to deviation of measurements." This is called the standard deviation.

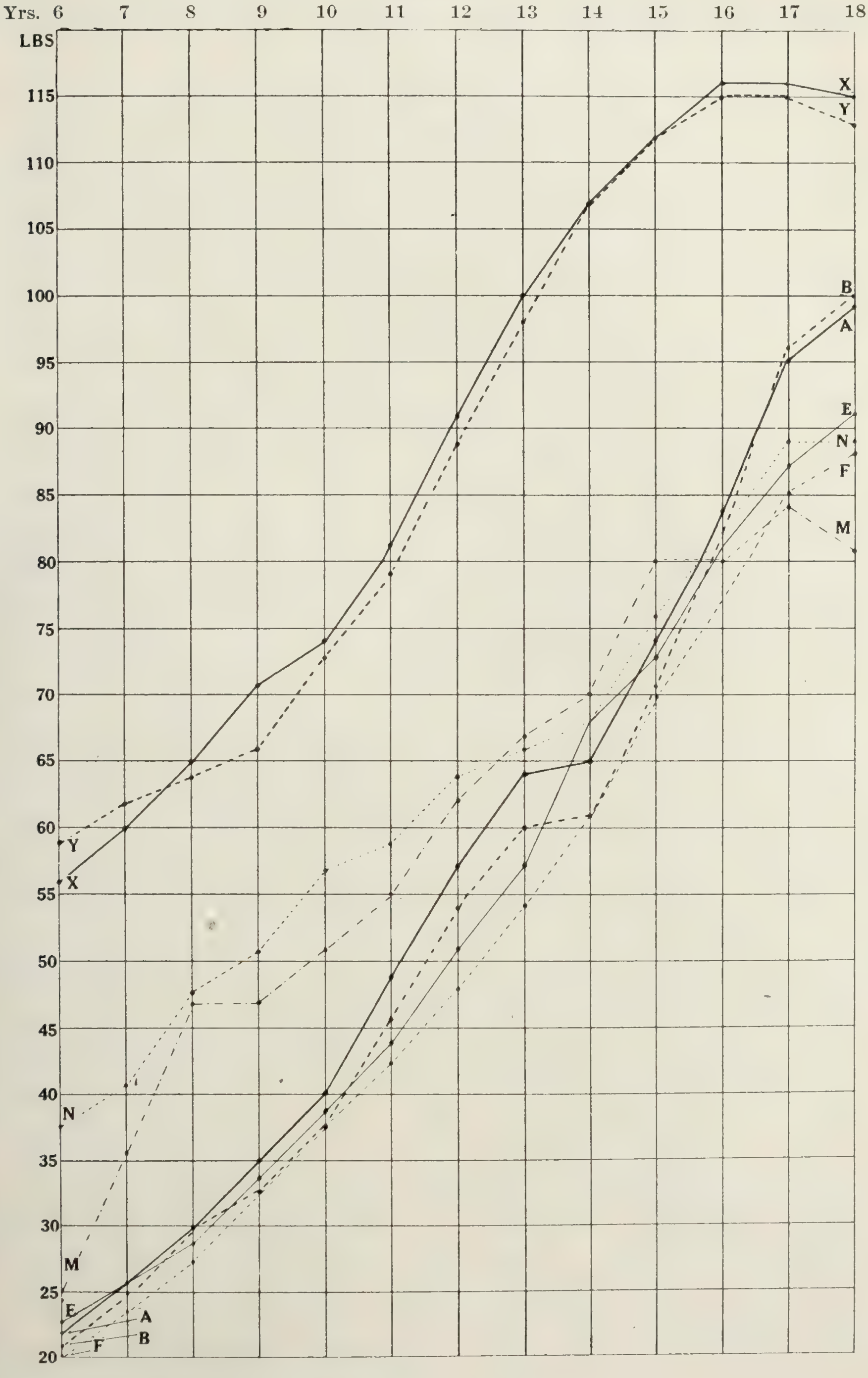
In the following charts the numerals arranged horizontally at the top represent years of age, and those arranged vertically at the side represent the pounds pressure registered in the tests. Charts I to III inclusive are the records of pupils at the Clarke School for the Deaf, Northampton, Mass., and the Pennsylvania Institution for the Deaf at Germantown, Pa. Charts IV and V include normal children in addition to the deaf of the other charts.

EXPLANATION OF DATA CONTAINED IN THE CHARTS.

Chart I.

Curves X and Y denote the averages of the biting pressures upon the first permanent molars, right and left respectively, of 130 boys with normal dentures. Curves A and B denote the averages of the records of grip strength, right and left hands respectively, of the same subjects as X and Y. Curves M and N denote the averages of biting pressures, right and left respectively, of 206 boys with abnormal dentures, and curves E and F the grip averages of these subjects. For instance, the average molar pressure of a boy eleven years of age with a normal denture, for the right side is 81 lb., left side 79 lb.; with abnormal denture, right side 55 lb., left side 59 lb. The right-hand grip of a boy at this age with normal dentures is 49 lb., left hand 46 lb.; with abnormal dentures, right hand 44 lb., left hand 42.5 lb. The pressures of the right and left sides of normal dentures average more nearly the same than do those of abnormal dentures. There is a strikingly significant parallel between the curves X, Y and A, B. The curves of the abnormal dentures M, N are markedly lower than the normal curves X, Y, and although the difference is much less between the abnormal grip curves E, F and the normal grip curves A, B, the former are lower than the latter throughout the greater part of their length. The greatest increase in biting strength is from the eleventh to the thirteenth year.

CHART I.



Yrs. 6
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11
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14
15
16
17
18
LBS
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105
100
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90
85
80
75
70
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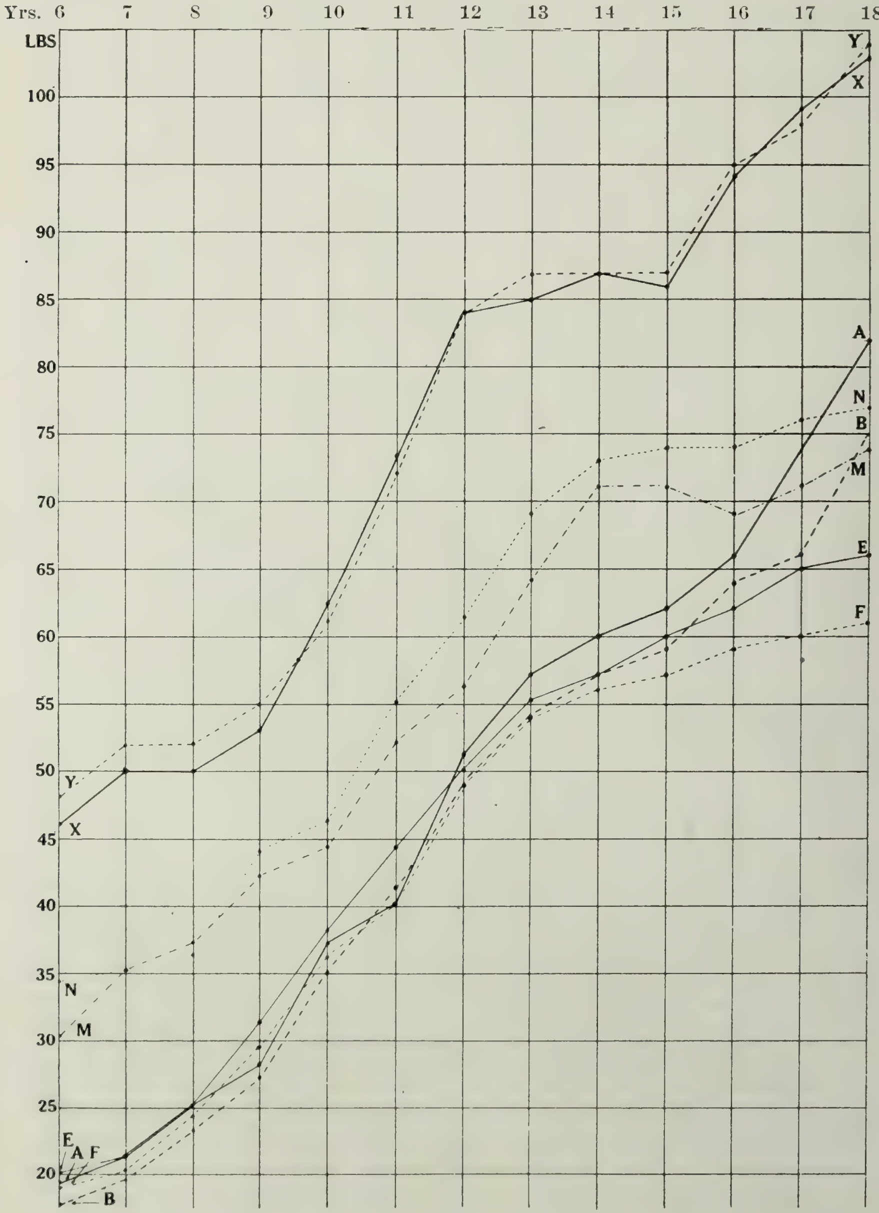
60
55
50
45
40
35
30
25
20
X
Y
B
A
E
N
F
M

Chart II.

Curves X, Y denote the averages of the biting pressures upon the first permanent molars, right and left respectively, of 107 girls with normal denture. Curves A, B denote right and left grip averages of the same subjects. Curves M, N denote the averages of biting pressures, right and left respectively, of 190 girls with abnormal dentures and curves; E, F, grip averages of the same. The curves of biting pressures of abnormal dentures are much lower than of

CHART II.



normal dentures, and the highest hand-grip averages of subjects with abnormal dentures are much lower than are those with normal dentures. As in Chart I, the difference between the averages of the right and left sides of the normal dentures is very slight as compared with the difference between the sides of the abnormal dentures. Also a like parallel is noted between X, Y and A, B, and here the parallel is evident between the curves M, N and E, F.

CHART III A.

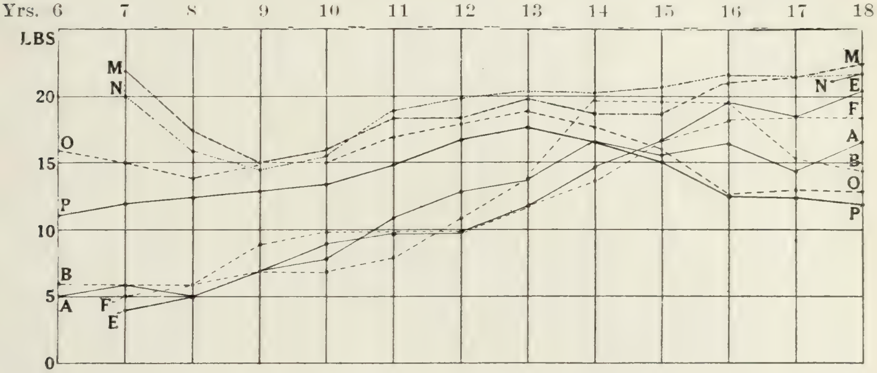


CHART III B.

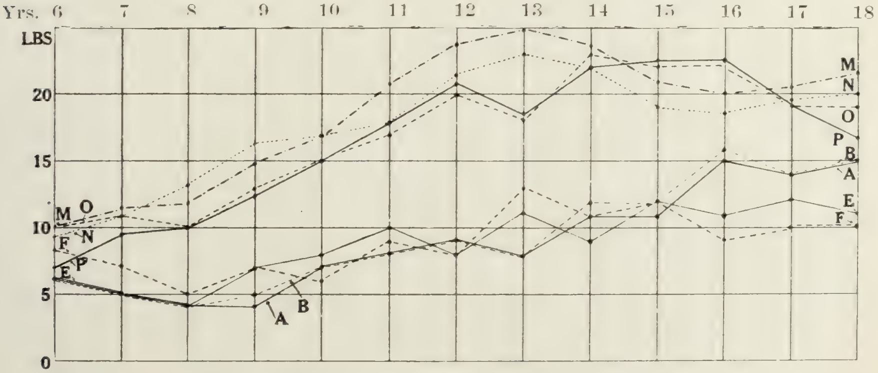


Chart IIIA.

This chart indicates the tendency of the individuals whose averages are shown in Chart I to deviate from those averages. The curve M denotes the standard deviations of the right molar pressures of 206 boys with abnormal dentures. For example, the point of the curve at eleven years of age is at 18.5 lb. This means that the tendency of the individuals to deviate from the average molar pressure for this age, *i.e.* 55 lb., shown on Chart I, is 18.5 lb. The curve N denotes the standard deviation of the left molar pressures of the same. The curve O denotes the standard deviation of left molar pressures of 130 boys with normal dentures. The curve P denotes the right side of same. The curves A and B denote the standard deviation of right and left hand-grips of 130 boys with normal dentures. The curves E, F denote the standard deviation of hand-

CHART IV.

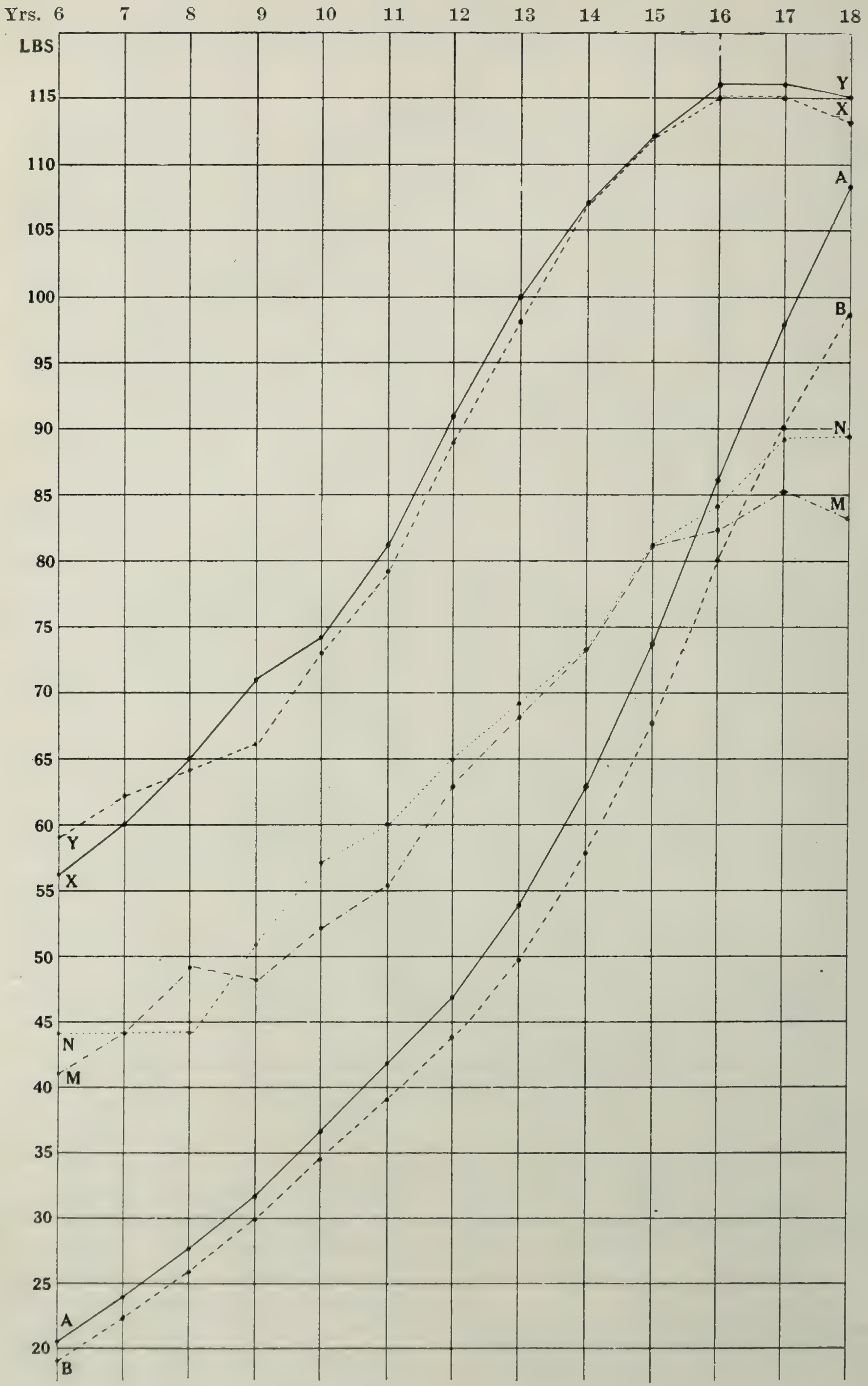

Yrs. 6
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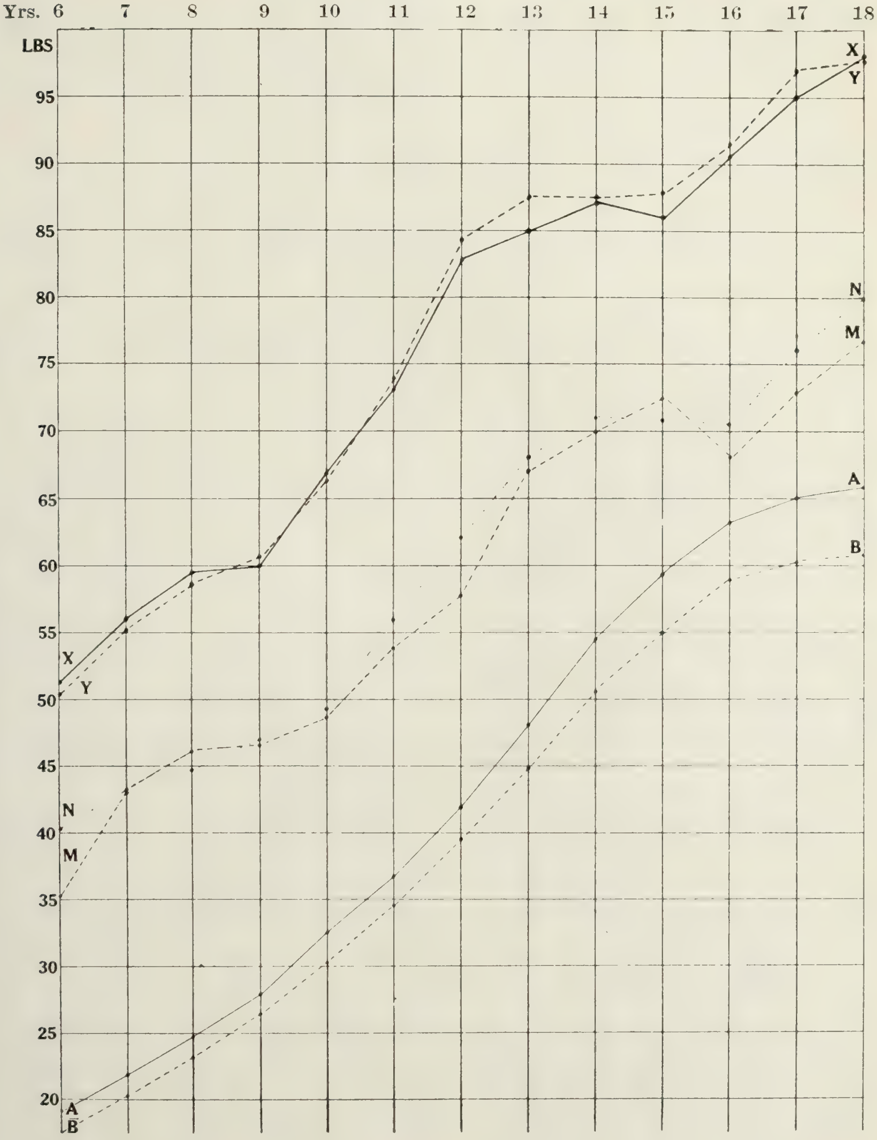
CHART V.



grips of 206 boys with abnormal dentures. This chart shows that the tendency to vary from the average is greater in individuals with abnormal dentures; that the left side varies more than the right side in normal dentures; that there is very little difference, considering the curves throughout their entire length, between the standard deviation of the hand-grips of boys with normal and abnormal dentures; and that up to fourteen years of age there is much greater variation in the records of molar pressures than in the records of hand-grip strength. The pubescent period with early adolescence exhibits the greatest variation in molar pressures of normal dentures.

*Chart III*B.

This chart indicates the standard deviation from the averages shown in Chart II—107 girls with normal dentures and 190 girls with abnormal dentures. The lettering is the same as Chart IIIA. From these curves it is obvious that there is a greater tendency for molar pressures of both normal and abnormal dentures to vary than for the grip records of the same subjects; that the greatest variation is shown in the molar pressures of the abnormal dentures during the pubescent period, and that the tendency to a general increase in variation marks the instability of the organism in its approach to adolescence.

Chart IV.

Curves X and Y denote the averages of molar pressures of 130 boys' normal dentures. Curves M and N denote averages of molar pressures of 226 boys with abnormal dentures. Curves A and B are the averages of Smedley's standard table for the hand-grip. Here the parallel between A, B and X, Y, and also the relative weakness of M, N, is very apparent.

Chart V.

Curves X and Y are the averages of molar pressures of 170 girls with normal dentures. Curves M and N are the averages of molar pressures of 280 girls with abnormal dentures. Curves A and B are the averages of Smedley's table for the hand-grip of girls. The parallel between the biting records is even more clearly shown than in Chart IV. The flattened curves of the molar pressures from twelve to fifteen years correspond to the rise in the curves of standard deviation. (See Chart IIIB.)

GENERAL CONCLUSIONS.

An investigation of this nature raises many interesting questions. The flattening of the curves of the molar pressures of the normal dentures of girls during the pubescent period, as seen in Charts II and V, is an interesting point, and suggests the necessity of research based upon physiological age. If it be a fact that the biting force of the jaws does not increase at this period, then this is a factor to be considered in orthodontic treatment. It also seems evident that the gnathodynamometer and hand dynamometer might be used to advantage conjunctively in the study of cases. One showing grip tests well up with the average for the age and jaw tests far below the average would suggest a very different condition than if the grip and jaw tests were both well below the averages and outside the range of standard deviations. The grip test has long been used by physical and psychical scientists as an index of general bodily strength. Then, again, if one side of the jaw registers a force of 20 or 30 pounds less than the other side, as often happens in cases of malocclusion, it is a functional condition which must be taken into consideration in treatment.

The examination of the dentures of hundreds of individuals in public schools and colleges changes quite materially the viewpoint of the orthodontist whose observations have heretofore been limited to the clinical material of private practice or of dental institutions. Conditions are so frequently evident which challenge certain phases of orthodox doctrine that it seems essential that the conception of normal occlusion as a working ideal in orthodontic treatment must be founded on the study of normal occlusion as it exists today, rather than as it lives in prehistoric skulls.

The records represented in the above charts do not form a standard table of averages; the tests have been too few. The charts merely point to the general tendencies manifested in the records we have made. Perhaps if the tests were extended to three or four times the number recorded the curves might be materially modified. Nevertheless, the writers believe that the results have been so consistent throughout this investigation that the curves constructed from our records do in a general way express the correlation of dental conditions, the biting force upon the first permanent molars, and the strength of the hand-grips.

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Pyorrhea Alveolaris.

By CHARLES KEYES, D.D.S., Rio de Janeiro, Brazil.

TO in some part answer the call that humanity makes for whatever may relieve suffering, the following is offered for consideration. Perhaps my own skill and other qualifications may have been deficient; however— after having used, as suggested by various advocates, trichloracetic acid, bifluorid of ammonium, silver nitrate, quinin sulfate, sulfuric acid, zinc sulfate and chlorid, lactic acid, salt, bismuth paste, iodin in combination with other drugs, and other combinations, all with varied success (perhaps it were better said failures!)—about two years ago emetin treatment was tried, strictly according to instructions as given by Dr. M. T. Barrett of the University of Pennsylvania.

NOTES OF CASES.

The following notes are taken from my records since that time:

Case 1. Mr. P. T., age fifty-nine years. Upper left first molar and all upper molars with pockets oozing pus. Nine treatments. No pus; gums shrunken and healthy.

Case 2. Mr. S. A., age forty-eight years. Superior left third molar, deep and painful pocket full of pus; had been giving trouble for a long time. Five daily treatments, and four at intervals of two and three days. No pus; gums shrunken and healthy.

Case 3. Mr. H. R., age fifty-seven years. Very arthritic. General pyorrhea of long standing. Prophylactic treatment off and on for years, teeth being scraped, etc., frequently. Tried almost every method of treatment, but never perfectly cured. Made twelve treatments consecutively with the exception of one day, then six more at intervals of two and three days. No pus, gums shunken and healthy, for the first time in about seven years. Superior second bicuspid very loose for over a year; still loose but tissues healthy around it.

Case 4. Mr. G., age sixty-seven years. Inferior incisors and lower third inferior molar, gums receded somewhat; no pain; pockets rather deep, not very much pus—very thick and yellow, however. Amœbæ scarce. Six daily treatments, and for a month more, from two to three treatments a week. No pus; gums healthy.

Case 5. Mrs. G., age forty-nine years. Superior second bicuspid and first and second molars with tissues much destroyed around them; on pressure pus and blood oozed from around them. Teeth painful. At the age of about twenty had lost one bicuspid from "looseness," etc. With one-day intervals nine consecutive treatments were given, then two and three per week for about one month more. No pus; gums healthy; no discomfort.

Case 6. Mrs. J. P. L., age fifty-three years. Inferior incisors quite loose and covered with deposits. No pain; deep pockets and pus. Six daily treatments, followed by two to three per week for two months. No pus. Gums healthy.

Case 7. Mrs. S. S., age forty years. Pyorrhea of long standing. Deep pockets around the inferior central incisors and superior left first molar. Thin, whitish yellow pus oozing from all pockets on pressure. No special discomfort. Six daily treatments and two to three per week for about a month. Did not return, but when last seen was practically cured.

Case 8. Mrs. L. A. M., age forty-five years. Just recovered from diphtheria. All three lower inferior molars and superior first and second left bicuspids—bloody pus from deep pockets. Not much pain. Seven daily treatments, and from two to three per week for something over a month. Cured.

Case 9. Mr. M. S. S., age thirty years. Pyorrhea around nearly all the teeth; has lost several; several others quite loose. Had undergone severe treatment for syphilis (neosalvarsan). Had been treated by autogenous vaccines (Wright's method). Had improved somewhat, but not very much. Six daily treatments, and from two to three per week for a month and a half. No pus; gums apparently healthy—beyond expectation.

Case 10. Mr. L. M., age sixty-one years. Nearly all except lower front teeth were more or less loose, and with deep pockets. Had been previously treated by Wright's method of autogenous vaccines, and improved very much; seemed cured for nearly a year. Returned as bad as ever with deep pockets and thick pus. Six daily treatments and from three to four per week for nearly two months. No pus. Teeth still very loose.

Case 11. Dr. A. F., age forty-nine years. Pyorrhea on almost all his teeth; several very loose, with deep pockets about them and with thick yellow pus exuding from the pockets. Six daily treatments and from two to three per week for two months. No pus; gums healthy and shrunken, teeth firmer, though several were still loose. This patient had been under treatment for about seven years for pyorrhea and had been treated by almost every known method by different dentists, and had lost several teeth. He uses a lower plate with several teeth. At present date (Feb. 22, 1917), over two years since treatment, the condition of his mouth is very much the same as when dismissed. It is worth noting that in this interval he has been only prophylactically treated at intervals of months at a time. He seems in better health than for years.

There follow about fifteen more cases, averaging very much as the ones cited above, and with results very much the same. Several cases have been lost to observation. Some who came from distant parts were never heard from after being treated. In about thirty cases that have come to our notice, there were four or five relapses.

Cases where no amœbæ were found have been treated by other methods, and as stated, not always successfully.

I wish to call attention to the fact that, contrary to all previous practice and precedent, the removal of deposits, etc., was *invariably deferred* until suppuration had practically ceased.

In all cases the patient was examined by a bacteriologist, Dr. Paul Brandão, and the emetin treatment only instituted in cases where the amœbæ were found.

CONCLUSION.

Be the amœba foe or friend, the emetin treatment, scrupulously followed, has given these results. Whether the cause of the pyorrheal condition be calculous deposits, malocclusion, mechanical appliances, faulty contours, sclerotic arteries, etc., and whether this kind of pyorrhea is due to biochemical disturbances, which may arise from the metabolic disorders resulting from irritation, and producing the various urea compounds—such as toxins, muscarins, cholins, leucomains, indol, and so *ad infinitum,* or whether the presence of the endamœba buccalis is the cause, the effect, or a coincidence, is of minor importance except as an aid to diagnosis. It is not without reason, however, to suppose that the endamœba may be present because it finds the pyorrhea pocket in this class of cases a habitat conducive to its development. Whether emetin serves as an amœbicide or only a stimulant to better cellular activity, normalizing metabolism, the results obtained are indicative that in cases of pyorrhea of this class, diagnosed by the presence of the endamœba buccalis, we have yet to find a better medicament for furthering its cure than emetin.

The Dentist Before the Law:

AN ANALYSIS OF

The Legal Aspect of General Anesthesia in Dentistry.

By HENRY SCHWAMM, D.D.S., LL.B., New York, N. Y.,
OF THE NEW YORK BAR.

(Read before the Harlem Dental Society, N. Y. City, January 18, 1917.)

A PERUSAL of the books and numerous articles on general anesthesia in dentistry fails to disclose a frank discussion of the legal phase of the subject. The reason for this lack is not far to seek. Many writers on anesthesia, without making a critical study of the law relating thereto, seem to assume that dentists have a vested right to administer general anesthetics; some seem to consider the legal part too delicate a proposition for general discussion; others are doubtful but take certain "authorities for truth," instead of "truth for authority." There are a few who insist that dentists have an undeniable right to administer general anesthetics and advocate an extension of that practice, but the teaching of these advocates is not always disinterested and is therefore nullified by the testimony of that group whose opinion is based on more altruistic principles. From these conflicts and confusion it is hard to arrive at any rational conclusion. But from my rather close observation of the practice of dentistry, through the eyes of the law, I have been driven to conclusions which I believe, without any desire to appear dogmatic or as the final authority, may be accepted as a correct interpretation of the law as applied to the practice of general anesthesia in dentistry.

THE DENTIST'S STATUS.

A consideration of competent authorities in the light of the present state of medical knowledge—in which light all such questions must be considered—discloses the fact that the right of the dentist to administer general anesthetics is not settled. The statutes which generally define the dentist's scope of authority are silent on this point, and the seriousness of the matter would seem not to permit the finding of such right by implication. For the same reason the implication cannot be deduced from the statutes requiring the dental licentiate to be examined in anesthesia, for it could be argued with equal force that he may practice general medicine because he is required to be examined in anatomy, physiology, materia medica, etc. A belief to the contrary, however, has been expressed by the attorney-general of Ohio: " . . . I am of the opinion that the requirement that an applicant for license to practice dentistry in this state shall be examined in the subject of anesthetics applies . . . to the administering of anesthetics . . . in the practice of dentistry . . . .[1] Which of these views the court would now follow depends on the method of reasoning employed. If the court should reason by induction—follow established custom—it would arrive at the last opinion; if it should employ the deductive method of reasoning—consider the underlying principles in the light of the present state of medical knowledge—it would refuse to recognize such right by implication.

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[1] *Lancet-Clinic* (Cincinnati, Ohio), 1912, p. 446.

The question is sometimes asked, "May duly qualified dentists act as the anesthetists in general surgical operations?" This question is in an ambiguous state, but there is a dictum which holds that the administration of anesthetics in surgical operations constitutes the practice of medicine and surgery.[2] This opinion is founded on general principles. In 1913, however, the legislature of Ohio enacted a statute which specifically widens the scope of the dentists' authority, permitting them to act as general anesthetists for physicians and surgeons. In England this question was widely discussed, a few years ago, by the General Medical Council and the Royal College of Surgeons, and the conclusion reached by these bodies is to the effect that duly licensed dentists may give general anesthetics in all cases. Recently a bill was introduced in the Legislature of New York tending to make it unlawful for dentists to act as such anesthetists.

QUALIFICATION THE BASIS OF RIGHT.

"True rights never conflict." The practice of general anesthesia by dentists seems to have been established by custom, not legal authority. A custom of such an important nature to be justifiable must be in accord with science, law, or morals. To satisfy either or all of these principles the dentist must possess sufficient qualification to be able to safeguard the welfare of the patient. The right, then, which the dentist claims for undertaking this important function must be based on proper qualification. In other words, whether he has such right is at present, owing to the absence of express authority, a question of fact, not law. What is the nature of such qualification? Let the court indicate:

"They knew that the plaintiff, while under the influence of the anesthetic, had no control of his faculties; that they were powerless to act, and that he was unable to exert the slightest effort to protect himself from any of the probable or possible consequences of the operation which they had undertaken to perform. He was in their charge and under their control to such an extent that they were required to exercise the highest professional skill and diligence to avoid every possible danger, for the law imposes duties upon men according to circumstances in which they are called to act. In this case skill and diligence must be considered as indissolubly associated. The professional man, no matter how skillful, who leaves an essential link wanting or danger unguarded in the continuous chain of treatment, is guilty of negligence, and if the omission results in injury to the patient, the practitioner is answerable."[1]

Although thirty-five years old, this leading case, interpreted in the light of the present surgical knowledge, means this: (1) That the practitioner who undertakes the administration of a general anesthetic must possess the highest degree of skill, knowledge and experience; (2) that he must know the physical condition of the patient by either examining him or having him examined by a physician—not merely superficially, but, as will be seen later, he must know all necessary facts, which means the examination of heart, circulation, lungs, kidneys, for anatomical defects, etc.; (3) that he employ proper apparatus, right quality and quantity of anesthetic, and administer the same according to a recognized and approved method; (4) that he be prepared and able, in case of accident, to render such treatment as may be necessary to save the patient's life; (5) that the administration and operation be not performed by the same person; (6) that the nature of the operation be such as, in the opinion of a skilful practitioner, to require a general anesthetic. In sum, he must be qualified to guard against any avoidable mishap to patient not only from the anesthetic, but during anesthesia as well. And therefore, according to rational principles of law and surgery, one who cannot or does not comply with the above requirements has no right to give general anesthetics. If he does, he is not only civilly liable in damages in the event of an accident, but is subject to criminal prosecution as well.

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[2] *Ibid.*

[1] Keily v. Colton, 1 City Ct. R. (N. Y.). 439.

SOME CONFLICTS.

A. *Question of authority.* Assuming that the physical examination by a dentist preliminary to the administration of a general anesthetic for dental purposes would not be held to constitute the practice of medicine, there are other operations such as laryngotomy, tracheotomy, which may have to be resorted to in case of accident resulting from the anesthesia. In this connection the recorded cases show the correctness of the statement that *"No administration of nitrous oxid should be attempted unless the anesthetist is prepared for a tracheotomy."*[1] That such operations are not within the scope of the dentist's authority requires no argument; that there are not many dentists who are prepared to perform such operations is also self-evident. The question then arises: May a dentist, who is not also a licensed physician or surgeon, administer a general anesthetic when he cannot lawfully perform the operations which may become necessary as a result of the anesthesia? On principle this question must be answered in the negative; in practice much will depend on circumstances, particularly on locality. It is plain that where the anesthetist is not in a position to render proper treatment in case of emergency he cannot "avoid every possible danger." How is this conflict to be overcome? Either by legislation, passing a statute requiring all those who engage in the practice of general anesthesia to obtain a special license, on the basis of qualification; or, which is more to be desired, by removing all disabilities by which dentistry is now handicapped; this can only be accomplished by raising the educational standard of the dentist to that of the M.D., thereby widening the scope of the dentists' authority. Or, as Professor Kirk suggests, by having a uniform curriculum for all who intend to engage in the practice of medicine or any specialty thereof, which is to lead to a baccalaureate degree in medicine. After obtaining this degree the student may take up the study of one or more of the specialties of which he wishes to become a licentiate.

B. *Single-handed administration and operation.* It is the consensus of opinion of the acceptable authorities that the giving of the anesthetic and operating by same person is dangerous practice. The English medical authorities have come out strongly against this practice. Dr. Hewitt, one of the leading writers on anesthesia, who is of the opinion that one only holding a dental qualification should in the future not be permitted to give general anesthetics, stated in the support of his opinion the remarkable fact that of thirteen recorded fatalities under general anesthesia administered by other than duly qualified medical men, the operation and administration had been performed by the same person in eleven.[1] By this practice the risk of general anesthesia is greatly increased, as the patient's condition cannot be observed by operator . . . "I remain unconvinced that it is right for any operator to assume, as regular practice, the responsibility for the management of an anesthetic and at the same time carry on an operation that ordinarily requires all his faculties to bring to a successful issue."[2] This opinion seems to be common among disinterested and well-informed men in the dental and medical professions. There are some opinions to the contrary, but they are not supportable by competent evidence. "As regards the question of operating single-handed, there can be no question that the practice is conducive neither to good anesthetization nor to careful extraction, but in this, as in other points of this controversy, we must preserve a due perspective . . . There are an immense number of people all over the country to whom the extra fee of a medical man or a second dental surgeon would be almost prohibitive."[1] The last part of this dictum may hold good as regards the "backwoods," but not as to larger communities, where there are offices in which, for the administration and extraction by competent operators, a fee of two dollars is charged in ordinary cases. If there exists any doubt that single-handed operations are fraught with danger, and should therefore not be practiced, the benefit of the doubt should be given to the patient.

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[1] Gwathmey, J. T., "Anesthesia," p. 137 (1914).

[1] *Lancet,* March 13, 1909, p. 790.

[2] Gillett, H. W., Tr. Dent. Soc. State of New York, 1914, p. 161.

C. *Is general anesthesia in dentistry a necessity?* It can be verified by unimpeachable expert testimony that at least ninety per cent. of the operations a dentist is qualified to undertake may be performed with much greater safety to the patient under local than under general anesthesia. As a point of law, where there are more methods of treatment at the practitioner's command with which he can accomplish the same purpose, he must choose the one involving the least risk to the patient. If he acts otherwise he does so at his own peril. Fischer quotes another authority (Kupfer) as stating . . . "I do not hesitate to maintain that general anesthesia . . . is unnecessary in operations in the oral cavity, and that, as a legal expert, I should be unable to protect an operator from indictment in case of fatal accident from general anesthesia."[2] The small percentage of dental operations which cannot be performed under the modern method of local anesthesia, which is practically devoid of all dangers, require the attention of a specialist anyway. It should be remembered also that in the absence of an emergency, when the surgeon knows himself not to be competent to perform a certain operation, it is his legal duty to inform the patient or to invite the aid of one skilled in that branch of practice. While some narcotic vapors are less dangerous than others, none is free from danger to health and life of patient. These risks are increased by the various idiosyncrasies, hidden physiological and anatomical defects, and the varying degrees of the operators' skill. Assuming that, in the event of an action, it is decided by the court that the right of the dentist to administer general anesthetics is well founded, the question, May general anesthetics be given for operations which can be performed under local anesthetics? would no doubt be answered in the negative by every well-informed judge. In other words, general anesthesia should only be resorted to as a matter of necessity, but the patient should never be deprived of the use of his faculties as a matter of convenience to the operator.

THE USE OF NITROUS OXID.

Nitrous oxid (N_2O), or nitrogen monoxid, popularly known as "laughing-gas," is considered the safest of all general anesthetics. It was first prepared by Priestley toward the end of the eighteenth century. The narcotic properties of the gas were discovered in 1844 by Horace Wells, a dentist of Hartford, Conn. Mortality under this anesthetic is variously estimated; some say one in twenty thousand, others say as little as one in five hundred thousand, and even one in a million; as a matter of fact there are no correct data available on the point. It is impossible to know how many times gas is given. Deaths occurring under this, as under other anesthetics, are seldom reported in professional publications, particularly those occurring in private practice. The few cases so reported are mostly from infirmary practice and should not be taken as a criterion. A better standard might be obtained from the books of the liability insurance companies. It is said that N_2O+O is the general anesthetic *par excellence* for use in dental practice. Such broad statements must be understood generally. Like all narcotics, nitrous oxid is an intoxicant, a tissue poison, and therefore potential of producing pathological reactions of various nature and degree, depending on the temperamental and physical state of the patient. Every administration of the anesthetic approaches very near an experiment with human life, for very little is known about its physiological action. In spite of the many theories, it is not definitely known in what way N_2O is taken up by the blood; nor is it known in what way the action of the nerve cells is arrested. For these and other reasons it is not safe to assume, as some claim, that this anesthetic may be taken by anyone who can withstand the shock of the operation.

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[1] Luke and Ross, "Anesthesia in Dental Surgery," p. 222.

[2] Fischer-Riethmüller, "Anesthesia," p. 96 (1912).

ACCIDENTS UNDER N_2O.

A. *Due to infirmity.* N_2O is, for instance, highly dangerous when given to patients who suffer from some asphyxial symptoms, such as narrowed air-passages, obeseness, swelling or engorgements of the neck, impaired mobility of lower jaw, alcoholics, strong smokers, etc. Here again the necessity of a physical examination preliminary to the administration of an anesthetic forcefully impresses itself. Although some claim, particularly Buxton, that much can be learned of the patient's state of health by inspection, it is maintained that if the patient appears to be of good vitality, physical diagnosis is not necessary. What is the attitude of the court in such matters? "There is a fundamental difference in malpractice cases between errors of judgment and negligence in previously collecting data essential to a proper conclusion, or in subsequent conduct in the selection and use of instrumentalities with which the physician may execute his judgment. If he omits to inform himself as to the facts and circumstances, and injury results therefrom, then he is liable."[1] And what are some of the results? A case is recorded where physical examination was omitted in which death under N_2O was due to goiter, which was disguised—as often by women.[2]

A patient died within three minutes after N_2O+O was given for an extraction, when an undetected abscess at the base of the tongue burst, at the height of anesthesia, and immediately filled the patient's lungs with pus.[3] Buxton cites a number of cases, from whose book the following three are culled:[4]

Nitrous oxid was given for the extracting of a tooth to a young woman suffering from an abscessed left tonsil. Respiration stopped as soon as the mask was withdrawn, and complete obstruction of the air-passages soon developed. Various means of resuscitation were employed, including a laryngo-tracheotomy, but the patient died within nineteen minutes.

A seventeen-year-old boy, with diseased glands in the neck, was anesthetized with gas for a dental operation. During the operation cyanosis appeared and respiration ceased. Tongue traction, artificial respiration, a low tracheotomy, were all in vain, the youngster's life could not be saved. In the last two cases, in addition to the infirmities mentioned, the post-mortem examination revealed also heart-trouble.

A man aged 33, suffering from glandular enlargements of the neck, was anesthetized by an experienced anesthetist. After the extraction of one tooth respiration ceased and the patient could not be brought back to life.

In the thirteen deaths under N_2O published by the *Lancet,*[5] the causes assigned are: (1) Asphyxia; (2) fright, or imperfect anesthesia; (3) congestion of the lungs, which was not known to be present before the anesthesia; (4) last stage of phthisis; (5) asphyxia due to impaction in the larynx (a) of a broken gag, (b) of a molar tooth; (6) syncope, three cases shock of extraction of a tooth in incomplete anesthesia; corset not loosened is another of the causes. Luke and Ross increase this list to about twenty, but the citations in their book are so unsatisfactory that they cannot be considered as correct data. Another list of fatalities under N_2O+O is that compiled by Miller,[1] but these cases are mostly in general surgery, which are to be distinguished from dental cases.

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[1] 30 Cyc., 1579.

[2] Buxton, W. D., "Anesthetics, Their Use and Administration," p. 78, 1914.

[3] Gwathmey, J. T., "Anesthesia," p. 338.

[4] Buxton, W. D., "Anesthetics, Their Use and Administration," pp. 122–24.

[5] *Lancet,* 1893, p. 1484.

The recorded serious complication under N_2O, in which there is ultimate recovery, are too numerous to cite. An idea regarding these may be obtained from the Report of the British Medical Association (July 1900) in which 21 complications are given out of 2911 N_2O administrations. Hewitt mentions two cases of asphyxia under N_2O during dental operations in which the patients suffered from osteo-arteritis; their lives were saved by a prompt performance of laryngotomy. Several cases are recorded in which the pressure of the goiter produced occlusion of trachea and consequent asphyxia, in which the opening of the windpipe was the only means of saving the patients. A considerable number of cases are reported where teeth, and various foreign bodies, such as large amalgam fillings, parts of broken forceps, small dentures, fell into the air-passages during anesthesia, causing grave complications. Complications are often caused by aspired vomit or regurgitated fluids. Buxton recorded a case in which round-worms were passed up in this way and caused respiratory obstruction. The latter points bring to the mind some plausible arguments for the "defense," but they are weakened by this: "The natural temperament or weakness of a patient contributing to produce the injury primarily caused by the unskilled treatment . . . is no bar to an action . . . for malpractice . . ."[1] In this connection it should be remembered that good practice does not permit induction of anesthesia shortly after a meal, as the digestive processes are retarded during anesthesia and the undigested food in the stomach is potent in producing complication. Points of defense, of which there are many, depending on the circumstances of the case, are not, for obvious reasons, considered as relevant to the subject of this article.

B. *Accidents due to the anesthetic.* Miller, in his well-supported article, mentioned above, gives the indication and contra-indication for N_2O+O, and a number of deaths due to the use of N_2O+O in cases where it was contraindicated. Out of seventeen fatalities, impure gas is mentioned as the cause in three, and anesthetic in five cases. It should be mentioned that those suffering from cardiac disease and arterio-sclerosis are bad risks under N_2O+O, although there are opinions to the contrary. According to Coburn, the increase of blood pressure caused by cyanosis throws extra work upon the heart which may lead to functional failure; in some subjects, too, increased blood pressure renders cerebral hemorrhage more probable. Hewitt says that in certain circumstances N_2O may be the most unsafe of all anesthetics. and on this only a medical opinion may be of value.[2]

The danger of impure gas consists of the presence of nitrous acid and other poisonous substances. Whatever is said against the use of N_2O by the unqualified, applies to other general anesthetics, except that the emphasis of the argument should be increased in proportion to the character of the vapor employed, and that N_2O is the least dangerous of all narcotic vapors is generally admitted.

QUALIFICATION OF ADMINISTRATORS IS PARAMOUNT.

It is agreed among the best authorities that the safety of the patient is not secured unless the administrator of the anesthetic possess a high degree of skill and training.[1] An analysis of the thirteen fatalities under N_2O recorded by the *Lancet* Commission shows that at least one-third were due to negligence or ignorance of operators. Lambert says: "The mere fact that the greater the ignorance the greater the self-confidence in giving the anesthetic is not conducive to the greater safety to the patient."[1] Connell, another expert, says: "While N_2O or N_2O+O is acknowledged as the safest general anesthetic, this rule as to skill and training is essential, since N_2O for prolonged operations is far more dangerous in unskilled hands than ether and chloroform."[1] Gwathmey[2] mentions a death occurring under N_2O administered by a reliable New York dentist, but in such a way that it is impossible to make a detailed report upon it.

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[1] Miller, A. H., "Gas-Oxygen Anesthesia, Indication for Its Use," *N. Y. Med. Journal*, January 24, 1914.

[1] Mullin v. Flanders, 73 Vt., 95.

[2] Luke and Ross, "Anesthesia in Dental Surgery," p. 218.

ANALGESIA.

This seems to be the proper place for a brief consideration of "analgesia," the prolonged and repeated administration of N_2O+O which is employed by some dentists for such minor operations as the excavation of cavities or removal of pulps. With the exception of a small minority, this practice is not regarded with favor by the profession, nor is it justifiable in law. It is not justifiable in law and not approved by the profession because it exposes the patient to unnecessary danger—that is to say, the ends thereby served do not justify the employment of such venturesome means. It is claimed that analgesia by N_2O+O is only a lesser stage of anesthesia and therefore less dangerous, that it prevents pain and its results—fear and dental neglect. But these arguments are based rather on sophistry than on facts. The facts are: (1) that analgesia may become at any moment deep anesthesia, depending on the susceptibility of patient and skill of operator; (2) that the skill required for this administration is not always possessed by a general practitioner; (3) that there are harmless and approved methods of accomplishing the same purposes; (4) that it tends to single-handed operation; and (5) that it may produce the same complications and after-effects as complete narcosis.

The danger of the patient's becoming addicted to this intoxicant is another very serious objection to this practice.

Speaking of *after-effects,* we come to another point of profitable discussion. To the reasons why a general anesthetic should be given only by the competent and in case of necessity we must add that of possible after-effects. These are of various nature. It is well known that central and peripheral paralysis may follow inhalation anesthesia. Among the after-effects of N_2O, writers mention: Headache, dislocation of jaw; loss of taste, anosmia, malaise, sleeplessness, glycosuria, diabetes. But it may be noted here that competent legal evidence to support such allegations would be very difficult to produce. Besides the foregoing, emotional disturbance, erotic dreams, and hallucination and maniacal attacks, may sometimes result from N_2O. Attacks of mental disturbance are most apt to occur in strong smokers, alcoholics, and where there is family history of insanity. To cite some of the cases of this nature recorded by Hewitt:[1] A "neurotic" man after taking N_2O had a maniacal attack and broke two dental chairs and a window. Another patient, in whose family insanity could be traced, damaged furniture to the value of two hundred dollars. A cigarette smoker, who inhaled about thirty cigarettes a day, broke the chair of a dentist after several attempts to anesthetize him. In the college infirmary of the N. Y. College of Dentistry, of which institution this writer is a graduate, a similar attack of mental disturbance occurred: A very muscular man of about forty rose from the chair after N_2O administration and assumed a threatening attitude. The prompt action of several students prevented him from causing damage. After recovering he said that "he dreamed he was in a saloon and somebody tried to do him." An unusual case of susceptibility is recorded, in which after a few minutes of inhalation of N_2O+O the patient remained asleep for four days.[1] While mental disturbance cannot probably be diagnosed before administration, the operator, however, may render himself liable in cases where he has, or should have, knowledge of such probability, without taking precautions to guard patient against injury to himself or others. One writer claims[2]—and cites interesting examples—that there is a close relationship between anesthesia and insanity.[3] The case of particular interest is that of a young woman, a chronic alcoholic, liable to hysterical attacks, who after the extraction of teeth under N_2O had an attack of delirious mania, which continued for three weeks and ended in dementia. Savage contends that the N_2O narcosis was directly responsible for the attack. We do not know of what standing, but there is an authority to the contrary, claiming that there is greater risk of an epileptic attack being produced by tooth extraction without an anesthetic than when one is used.[4] Local anesthesia is a conclusive answer to this theory.

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[1] See Trans. Dent. Soc. State of N. Y., 1914, pp. 158–63.

[2] Gwathmey, J. T., "Anesthesia," p. 846.

[1] "Anesthesia," p. 538.

Shock, post-anesthetic toxemia, criminal face, etc., are other points pertinent to this subject, but a consideration of these here would prolong this article unduly.

CONCLUSIONS.

I have endeavored in this communication to lay before you such premises from which you may draw your own deductions and conclusions, but it is submitted, without any intention to underrate the important rôle which dentistry is playing in the healing art, that the following are irresistible:

1. Before the right of the dentist to administer general anesthetics is expressly established by a judicial, legislative, or educational enactment, the only safe guide for the dentist to follow is proper qualification.
2. It would seem that qualification is not complete without the ability to render proper treatment in case of emergency arising during anesthesia or caused by anesthetics.
3. Special license, on the basis of qualification, should be created for those engaging in the administration of general anesthetics.
4. Single-handed operation is clearly illegal, a menace to life of patient, and invites trouble for practitioner.
5. As a matter of law, general anesthesia is not permissible when local anesthesia—a safer agent—can be employed for same purpose.
6. Analgesia, for excavating cavities and similar minor operations, is an unjustifiable practice.

In order not to stray from these conclusions we must leave out all selfish considerations, vague rights, blanket justifications, and consider only facts.

174 E. 74TH ST.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

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[1] *Ibid.*, p. 329.

[2] Savage, G. W., *Lancet*, November 11, 1899.

[3] *Ibid., Brit. Med. Journal*, December 3, 1887, p. 1199.

[4] Braine, W., Med. Soc. Proc., London, 1885, VIII, p. 64.

Regional Debility in Riggs' Disease.

By M. H. CAZIER, M.D., New York, N. Y.

(Read before the Northeastern Dental Association, Hartford, Conn., October 11, 1916.)

ASSUMING that the dominant thought of the dental profession is reflected in the current literature, we may reduce to concreteness present-day conceptions of the pathology of Riggs' disease by the phrase, *"inflammation* due primarily to *irritation,"* or *"infection* due primarily to a specific microorganism," and assume that the practice of its votaries consists of efforts to remove the mechanical irritation or to kill the offending germ, adding such agencies as are supposed to reduce or control the inflammatory process.

The appearance of this paper upon your program is due to the fact that its author entertains beliefs which are at absolute variance with both of these postulates.

First of all, my belief is that the real condition is not an inflammatory but a degenerative process, and if any inflammation attends it is incidental and unimportant; and here the entire issue is joined, for if we show this to be a fact, then the remaining postulate and the practice built thereon must be modified to meet the indications of the newer light.

Among those contending that the tissues are inflamed, one writer gives the following reasons: "The parts bleed on slightest touch"; another, "Pus is welling up around the tooth"; a third, "The gums are swollen and of an unnatural color." Translated, then, the word inflammation must mean *any local condition which is abnormal.* This is a serious error, and must be corrected if we are to reach rational views and rational and successful practice.

Speaking generally, lesions of the body may be divided into two groups, sthenic and asthenic—an old classification, but somewhat instructive.

The sthenic comprises those lesions wherein nature is making active efforts to repair an injury or to resist invasion. This is only possible when the tissues are of approximately normal vitality. This is the inflammatory type.

The asthenic lesion is represented by the minus sign, the group of lesions occurring in parts where nutrition is below par, meaning that the metabolic process is on "low speed." The condition may be local and due to inadequate nutritive supply, caused by local disturbance of circulation; or it may be general and due to constitutional ailments, or it may partake of both causes, as is seen in bedsores, ulcers of the pedal extremities, senile gangrene, and other degenerative conditions.

It must be apparent that ability to distinguish the difference and to recognize its importance is essential as a guide to appropriate practice.

In the sthenic type of lesion the forces of the organism are already at work, and are vigorous enough for the task. Our duty, then, is largely to remove the excitant, and observe the phenomena; we have simply nature's process of repairing injuries and healing wounds; it is metabolism on "high speed," in other words *inflammation.* It frequently requires direction or control, but rarely if ever should it be subdued.

In Riggs' disease the lesion is asthenic, and due to inadequate arterial supply with passive venous engorgement

—regional debility. This is the case even when the general vital conditions are normal, and the first duty of the surgeon is to restore the vital equilibrium.

It is a well-established fact in histology that the alveolar process is nourished by arterial spurs given off mainly at right angles from the principal arteries of the jaws, and that these spurs, ramifying in the cancellous alveoli, breaking up into capillaries, and returning as veins, and therefore end-organs in bony substance.

The very nature, therefore, of the arterial mechanism carrying the blood supply renders nutrition precarious, and is perhaps never adequate in the majority of individuals, becoming markedly inadequate with the intervention of pregnancy or disease, or when advancing years render the arterial system less resilient, and consequently less efficient. This deficiency manifests itself in the senile degeneration of the alveoli, and if uncomplicated by irritation, results in simple atrophy, the parts shrinking in contour but retaining continuity.

With the advent of irritation from malocclusion or other causes, a solution of continuity occurs, and the waste from the resulting lesion forms the deposits, and affords infection the opportunity of becoming the most prominent symptom and impressing the nosology, unhappily, with the name "pyorrhea."

The alveolar process has long been regarded as a "transitory member"; it is so simply and solely because nutrition fails. It has been pointed out in the literature for generations that the process undergoes senile dissolution the first of any tissue of the body, but until very recent time no practical application has ever been made of the fact. It was looked upon as though, like the movements of the planets or the tides of the sea, it were entirely beyond human control; and although this structure is admittedly the essential seat of Riggs' disease, the fact of its habitual degeneration has not until now been recognized as the basic pathological element.

The fact that blood supply can easily be made adequate, that metabolism is encouraged by massage, that supplying these results in a checking of the waste, that when this is accompanied by proper treatment recovery follows, and that the vital resistance so established resists bacterial infection, are now among the well-attested facts of clinical experience. Scores of practitioners on the Atlantic seaboard, with hundreds of patients, witness the success of treatment when the necessary but simple technique is carried out.

The author made a series of studies on cadavers confirmatory of the admitted fact of the senile changes in the alveolar process. The important fact disclosed was that changes in the bone precede the external symptoms. Evident signs of necrosis in spots at the alveolar crest were noted before infection, recession, or deposit had appeared. These facts, together with previous studies of other and more competent observers, place regional debility first among the causes of Riggs' disease, and place irritation, infection, and traumatic injuries in the category of contributory causes.

Regional debility of the investing structure of the teeth affords the condition which accentuates the effect of irritation and invites infection. It is often merely due to the local causes above enumerated, and is to be overcome by local measures adapted to cause a "renewal of life" in the part. The condition is frequently aggravated by systemic defects, but it is beyond the province of this paper to discuss that phase of the subject. This has led some authors into an attempt to show as many varieties of this local malady as there are forms of systemic ailments—which can have little other effect than to confuse and confound.

TREATMENT.

The author, for more than thirty years, has treated lesions due to regional debility by inducing arterial hyperemia, with signal success. In rather recent years the practice has been popularized in the literature by Professor Bier of the University of Bonn. The most common method of Bier is to thin the air by suction, reducing the atmospheric pressure, which in turn gives fuller sway to the arterial pressure. The venous radicals are unloaded and arterial hyperemia results. The suction apparatus may easily be used to aspirate sinuses about the teeth, and also may be adapted to produce massage.

Treatment of ailments addressed to secondary causes very frequently dazzle and mislead. Such efforts may modify symptoms and result in improvement, but recovery is reached only in so far as we reach and nullify the continuing fundamental cause.

Whatever methods may be favored by individual practitioners, directed to the removal of secondary causes, irritation or infection, we must realize that to reach real recovery we must ever depend upon the *vis medicatrix naturæ,* and so direct the local treatment, as well as the diet and the regimen of our patient, that infection in the mouth shall be met by an overwhelming vital resistance. This is immunity, and it resides in the germicidal power of the blood and the antibodies, and is the protective principle which has saved the human race from extinction through all the ages of the past.

In the purely local treatment, the removal of deposits by operative procedure, it is perhaps possible to attain to such a degree of expertness as enables the operator to proceed in the deeper sinuses, where live and dead tissue is intermingled, blinded by the flood of venous blood, inhibited by the pain the patient suffers, and to remove the offending substance with a minimum of damage to live tissue. But this is rare ability and can minister only to the few, and even with this extra development of operative skill, the author would suggest a reduction of the danger to live tissues, a lessening of the difficulties which beset the procedure, by the employment of such circumspection as the general surgeon uses when he prepares the patient and the field for operation.

This means that the debility of the tissues must be replaced by vital energy, that a line of demarcation shall be established as a guide to the operator, that venous engorgement shall disappear, that tumefied gum tissue due to stasis shall give place to normal, and withal, that a beginning inflammation of live tissue, involving pericemental membrane and bone, evidenced by swelling and exudation, aided by aspiration, shall evict foreign elements wherever attached to structures capable of this reaction. By this means the operation is greatly simplified, and made safe and efficient in the hands of the general practitioner, who after all must minister to the multitude, and in whose hands treatment heretofore has been disappointing.

Reducing the indications to a program this treatment means the postponement of instrumentation, except the removal of extra offending tartar, making it the last thing to be done. First, daily drainage, hyperemia, and massage should be instituted; second, and after a week or ten days, when vital conditions will support reaction, treatment of the walls of the sinus by instilling into the pocket an acidulous solution, every fifth day.* This causes reaction, swelling of the live parts and shrinking of the dead, and besides it deals death to the micro-organisms, and softens somewhat the deposit. The swelling of the peridental membrane dislodges deposits, the temporary irritation of the marginal surface of the bone stimulates osseous development, sinuses grow smaller, vital and dead tissue is put in contrast, so that "velvet" and "sandpaper" are easily differentiated, and the final scaling and polishing of the necks can be done under more favorable conditions to both operator and patient, and should be made as complete as skill can accomplish.

Following this line of practice restores the vital conditions at the outset, and reduces to the minimum the dangers of systemic infection, conserving at once both the welfare of the patient and the dentist's conscience and reputation.

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* The author employs a 25 per cent. solution of c.p. sulfuric acid, in 65 per cent. alcohol, to which is added 2.5 per cent. synthetic salicylic acid.

SOME ERRONEOUS IDEAS TO BE AVOIDED.

(1) That degenerative changes due to regional debility constitute a "low form of inflammation." Inflammation is vitality *plus,* and to confuse the terms regional debility and inflammation would be as misleading as abolishing the minus sign in mathematics and calling it a "low form of plus."

(2) That numerous drugs are required in the treatment of Riggs' disease. Remember the truthful adage that "A multitude of remedies is the child of ignorance."

(3) That you must seek to drive out inflammation. Think it over; it is not there, but must be induced before recovery can ensue.

(4) That any drug is "healing." Nature is the only healer, and we must not obstruct her processes, but seek to aid them.

(5) That our chief duty is to "cast out devils" by infiltration of necrotic tissue with drugs; better far the *vis medicatrix naturæ,* the most potent and never harmful agent.

CONCLUSIONS.

First: Riggs' disease results primarily from degenerative changes in the investing structures of the teeth.

Second: Irritation, as the important secondary cause, would not, with normal vital resistance, result in destruction, but would lead to reaction and repair.

Third: The primary cause is the result of inadequate nutrition — regional debility of the deeper structures. Changes in the gingivæ are merely symptomatic.

Fourth: In induced hyperemia we have a therapeutic agent of great value.

Fifth: Scaling is more easily performed, less in extent, and safer to patient, if done after the parts are cleansed and revitalized than before.

110 West 40th st.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

The High-Frequency Current.

By Dr. W. H. PERRY, Cambridge, Mass.

THE violet-ray high-frequency generator was introduced to the dental profession some time ago, and in the opinion of many of the users of this instrument it is not receiving the attention it deserves.

It was placed on the market at a time when electrical therapeutics was being widely advertised, and in company with several other and more expensive machines, for which extravagant claims were made. The failure of some of these machines to substantiate in actual practice the theories which resulted in their manufacture has caused more or less condemnation of the entire lot, which is unjust to the simple and inexpensive high-frequency violet-ray apparatus. This wholesale condemnation without information and investigation is to be regretted, as it is depriving many conscientious operators of the use of an instrument of considerable therapeutic value.

To many dentists the violet-ray machine is something of a mystery. They have seen it, possibly used it, and perhaps have secured results that have pleased them. They appreciate the effect it would have on the mental attitude of their patients at once—for what is a mystery to them will be even more of a mystery to their patients. It depends sometimes on the business acumen of the dentist as to whether or not a machine is purchased. In many instances a machine may be bought and used continuously with good results, the operator not knowing or being at all concerned as to how these results are produced, or considering for a moment that there may be latent possibilities in the instrument worth developing.

The manufacturers of the various types of high-frequency generators have issued booklets for the instruction of prospective purchasers. These booklets are rich in detail as to what the violet ray will do, with careful instructions as to how to use it; but this class of literature is interesting chiefly because of the absence of concrete information as to why these effects are produced.

In fact, there is practically no reliable literature on this theme, what little there is being contradictory and confusing, no one apparently having taken the trouble to investigate the subject.

A spirit of curiosity is responsible for much of this article, and has led the writer to garner information where he might, and to apply a little logic to the solving of the problem in the hope of bringing about a better understanding of the principles involved in the violet-ray treatment, and perhaps to increase its scope of usefulness to the average operator.

The violet-ray current is an alternating current produced in a vacuum by a lack of ampèrage, and discharging its energy in oscillations of great frequency, nearly a million discharges per second. It is the ordinary illuminating current "stepped up." The strength of this current is exceedingly great, but its volume exceedingly small. In some machines 50,000 volts is the minimum amount to be administered to a patient. It requires approximately 2000 volts and 11 ampères to electrocute a person, but here, in addition to the force or voltage, there is a corresponding increase in ampèrage or volume. In the violet-ray machine the ampèrage is practically nothing, while the voltage is tremendous.

This high voltage can be administered to patients by reason of its high frequency, the tissue not being able to react to the strength of the charge before it is withdrawn and another substituted. An analogous example to this is the optical effect produced on a passenger riding on a train past a picket fence. The eye is not able to retain the picture of each individual picket, the fence having the appearance of a solid board, or only a blur on the landscape, depending upon the distance between the pickets of the fence and on the speed of the train.

The average operator, on acquiring a violet-ray machine, is puzzled by the lack of the ground connection with which the ordinary electrical apparatus is equipped. The cathode and anode pass out of the electrode together as a unit of force. In applying the electrode to a spot on the face of a patient the entire system receives the charge, the point of application being the driving-point.

THERAPEUTIC VALUE OF THE VIOLET RAY.

The claim is advanced that the action of the violet ray will produce sterilization. It seems to do this, and the best explanation of how it is accomplished is believed to be as follows:

The tissues and blood contain a large amount of sodium chlorid—the normal saline solution. When a charge of electricity is passed through a wet medium, electrolysis takes place, and the sodium chlorid is changed into sodium hyperchlorite, an oxydizing agent and germicide, the action of which on the tissues sterilizes them.

The value of the violet ray in reducing a swelling lies in the fact that the molecular bombardment of the tissues produced by the rapid oscillations of the high-frequency generator increases the bodily heat without an increase in bodily temperature. Heat is stimulated by the increased production of oxygen in the form of ozone, and by the increased force and volume of the electrical content of muscle tissue. The violet ray thus loosens mechanically and chemically molecular energy, has a highly energizing effect locally, and produces an increased tonicity of the part adjacent to the point of application. In this manner, with the tissues in a passive state, not only are the energy-producing properties stimulated, but also the eliminative functions, thus maintaining a normal balance. Diffusion of energy accompanied by the elimination of waste is attended also by a mildly soothing effect that seems to allay irritable nervous symptoms and produce a relaxation that inspires confidence on the part of the patient in the work of the operator, this nervousness being no inconsiderable obstacle to be overcome daily in the average dental office.

THE VIOLET RAY AS AN AID IN DIAGNOSIS.

The diagnostic value of the violet ray can be illustrated as follows: Many dentists have wasted much time in trying to accurately determine whether or not the pulp in a questionable tooth is vital. Application of a spark from an electrode to the tooth will generally settle this question in a moment's time. This test, however, is not always infallible; but in every case in which I have used it and received no response, upon drilling into the tooth, if not completely devitalized, the pulp has been found to be in a diseased and dying condition.

If, however, one should find the pulp not completely devitalized, a facial treatment in the region of the aching tooth will stop the pain, and many hours of suffering may be avoided.

A summary of the value of the high-frequency apparatus in the field of dentistry appears to include stimulative, diagnostic, eliminative, sedative, and germicidal qualities, with certain caustic properties. Incidentally, it is not the ray that accomplishes these effects, but the charge of electricity. The ray would be equally valuable in this connection were it green or blue instead of violet.

There are many things for which the high-frequency current may be used which cannot be accomplished in any other manner. For instance, the high-frequency current when applied to the tissues liberates nascent chlorin, and drives it farther into the tissues.

A ten-minute treatment with the high-frequency current is a harmless and soothing method of sterilization. As the operator becomes familiar with the principle of the violet ray his reasoning encourages him to apply the current in a variety of instances for which there is at present no recognized treatment. In some instances he may be successful in this apparently careless employment of the ray, and in some he may not be successful; but of one thing he is certain, he is doing no harm.

I had a case a short time ago where two devitalized teeth were extracted because there was necrosis in the alveolus involving the apices of the roots. After extraction there was pain and a burning sensation, as the patient expressed it. After trying several methods of treatment I applied the violet ray, which immediately gave relief, and after a few treatments the pain ceased and the sockets soon healed.

A crystal of carbolic acid placed in the cavity of a sensitive tooth and the current applied effectually obtunds the sensitive dentin sufficiently for the operator to excavate the cavity.

In cases where the patient is suffering from an impacted molar and cannot open his mouth to permit an examination, one treatment with the surface electrode will generally enable the patient to open his mouth, and afford the operator access to the part.

A broach dipped in any suitable medicament, placed in a root-canal and touched with the pointed diagnostic electrode with a mild flow of current, drives the drug to all parts of the affected area more rapidly and effectually than any other method.

There is a wide field for this high-frequency apparatus, as yet but partially developed. I am not claiming that the high-frequency violet ray is a cure-all, for it is *not* by any manner of means, but it is a valuable adjunct to the equipment of the average dental office.

1878 Massachusetts Ave.

Extraction of the Deciduous Teeth.

By RAFIDIN AHMED, D.D.S., Boston, Mass.,
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IT is often thought that the extraction of the deciduous teeth is a very easy operation, but when we consider the circumstances under which the teeth are to be extracted we find the procedure is not so entirely easy. Apart from the fact that the child, somewhat more than the adult, dreads extraction, we have to deal with an undeveloped mandible and maxilla. Therefore, great care and precaution are necessary; in fact, it requires just as much tact and skill as are needed in the extraction of the permanent teeth.

THE DIAGNOSIS FOR EXTRACTION.

(1) It is a fact that the deciduout teeth should be retained in their places until their permanent successors are about to appear. It is needless to go into detail as to the beneficial effects of keeping the deciduous teeth in order to the normal development of the face and jaws; but unfortunately the child sometimes reaches the dentist too late for any conservative treatment. Simple exposures of the pulp can very well be treated and the teeth saved. Abscessed or putrescent teeth would perhaps call for more radical measures. The diagnosis for extraction should be made after careful examination, in which the operator should use his own judgment. However, there seems to be a consensus of opinion that abscessed or putrescent deciduous teeth are for various obvious reasons very hard to treat and preserve, and that in the majority of cases the child would be better off without them.

(2) Deciduous teeth whose roots have been wholly absorbed.

(3) Deciduous teeth whose roots are partially absorbed and which are retained too long in their places and are an obstruction to the oncoming permanent successors, causing malocclusion. In this connection it is well to remember the time of eruption of the permanent teeth and the decalcification of the deciduous teeth, to guide us in the diagnosis.

(4) Oftentimes we are confused by a supernumerary or a permanent tooth and a too long retained deciduous tooth presenting side by side. In the average case the color, the shape, with the peculiar bulging at the neck, would indicate a deciduous tooth unmistakably; but in some cases they are liable to confuse the most experienced operator. Radiographs in such cases are of the greatest value and should be taken advantage of in making a correct diagnosis for extraction.

PREPARATION OF THE PATIENT.

The teeth should be examined with a mouth-mirror and explorer, and those that are to be extracted should be carefully noted on a chart. The mouth should be washed out with an antiseptic solution, and if there is any well-developed abscess it should be lanced, using the ethyl chlorid spray as the anesthetic so as to reduce the danger of infection to a minimum. If a general anesthetic be indicated, the usual routine should be followed.

THE ANESTHETIC.

In extracting children's teeth the first thing to do is to gain the child's confidence. How this is to be done is entirely a personal question, and different operators would probably use different methods. However, it is not wise to make extravagant promises as to the painlessness of the operation, as it may turn out otherwise.

(1) For teeth that are wholly or partially absorbed, the ethyl chlorid spray is perhaps the best anesthetic we have today. The method of application is to dry the gums around the tooth to be extracted, and, holding cotton-rolls in place to prevent saliva from flowing over the parts, to spray the gums until they are frozen white. It is not infrequent that we meet children who can be made to sit in the operating chair only by coaxing or by force, and when the operator locates the guilty organ and takes up his forceps to extract, the child immediately shuts his mouth and will not part his lips. In these instances we can close the patient's nose and force him to open his mouth a little, thus giving us an opportunity to use the wooden mouth-prop. In such cases it is advisable to use ethyl chlorid as a general anesthetic, administering it by the drop method or loosely packing the mouth with gauze, and spraying the ethyl chlorid on the gauze while closing the nose with the left hand. Narcosis is produced in from thirty to forty seconds, and lasts from forty to fifty seconds. The anesthetic signs are the same as those for nitrous oxid, the masseter muscle being specially liable to spasm.

(2) Quite often we meet a child whose teeth are in a confused disorder, with roots of deciduous teeth, abscessed teeth, and misplaced permanent teeth present, all suggesting a not too rigid oral hygiene. If there are several teeth to be extracted, nitrous oxid and oxygen would perhaps be the anesthetic indicated.

(3) Sometimes we meet cases where a deciduous tooth is to be extracted in which the roots are not yet absorbed. We know the roots of the deciduous teeth diverge more than do those of the permanent set, and are just as hard to extract as any permanent teeth. In these cases novocain, by infiltration or by conductive anesthesia, can very well be used. If novocain injection cannot be made without protest or violence from the little patient, we have to fall back on nitrous oxid and oxygen. The technique of injection of novocain would be the same as in the case of the permanent teeth.

INSTRUMENTS AND TECHNIQUE.

A rubber mouth-prop may sometimes be of use in novocain anesthesia. Denhart's mouth-gag is suggested for nitrous oxid-oxygen anesthesia. Throat-packing would be necessary in the latter case. I find that only two instruments are necessary for the extraction of any deciduous teeth in the mouth—namely, a pair of universal deciduous forceps and a fish-tail elevator. (See Figs. 1 and 2.) By simplifying the number of instruments the operator saves time in not having to change forceps, and can quickly accomplish the necessary extractions. It should be specially noted that quick work is a great advantage in the case of children's teeth; the tooth should be out before they know it. The forceps advocated can be used for both upper and lower jaws and for both anterior and posterior teeth. The elevator is sufficient for any roots that are obstinate. The writer has not yet encountered any case of a deciduous tooth which he could not extract with these two simple instruments, although he has handled hundreds of cases at the Forsyth Dental Infirmary for Children. In some cases a lancet may be of use, but it is not absolutely necessary.

The position of the operator is just about the same as for the extraction of permanent teeth.

PRECAUTIONS.

In extracting any deciduous tooth the jaw must be supported with the left hand. As any unnecessary pressure or force at a wrong angle might cause dislocation of the undeveloped temporo-mandibular articulation, therefore the position of the left hand is very important. In using the forceps or the elevator great care should be exercised not to disturb the oncoming permanent tooth. Experience will develop the sense of touch in relation to the enamel of the permanent tooth. Again, it is always an imperative necessity to remember the age of the child, so that we can say approximately whether or not the permanent successor will be encountered.

ACCIDENTS.

Accidents are liable to happen even with the most careful and experienced operators. One of the probable accidents and one that should be carefully guarded against is the luxation or accidental extraction of the unerupted permanent bicuspids when trying to extract the roots of the deciduous molars. If the unerupted permanent bicuspid is but slightly loosened, it should be left in its place, and nature and the force of mastication will in the majority of cases take care of it. If, however, the bicuspid has been accidentally extracted, physiologic reimplantation, under absolute asepsis according to Kauffer's method, is the only remedy. Dislocations, fractures of the mandible or extreme hemorrhage, and other complications, may occur in extracting deciduous teeth, though but rarely if proper precautions be taken.

POST-OPERATIVE TREATMENT.

The mouth should be rinsed frequently with a warm antiseptic solution, as it is of the utmost importance that the mouth be kept clean until the gums are healed. Several cases have come under the writer's notice in which infection has occurred from eating cheap candy a few hours after extraction, and thereby retarding the healing of the gums. In growing, healthy children the conditions are very favorable, and we can look forward to the prompt healing of the gum tissue.

140 The Fenway.

Fig. 1.

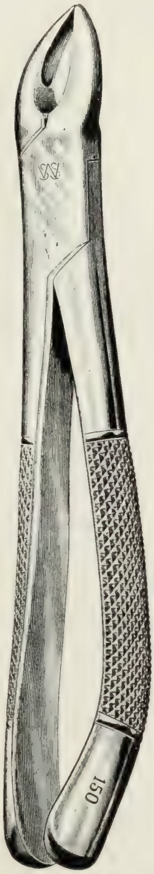
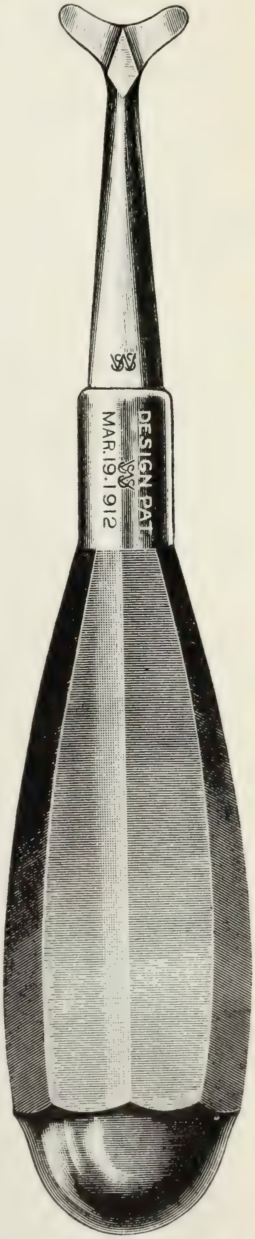


Fig. 2.



The Uses of Holes in Impression Trays.

By ISIDORE CLIFFORD, L.D.S., London, Eng.

THE first use I made of holes in an impression tray was to make them in the center of the palatal portion of the tray for plaster impressions in edentulous cases. The holes were made of sufficient size for an ordinary wax match to pass through. While the plaster was still in the mouth, and before it had hardened I passed a wax match or blunt instrument through the plaster until it touched the palate, thus making a vent for the air, and enabling the plaster impression to be removed more easily.

Finding this successful I now adopt similar measures when taking composition impressions of cases where teeth—especially long teeth—are present. I make a hole in the tray over the top of each long tooth, and while the composition is hardening in the mouth I pass an instrument through each hole until it touches the tooth. In taking impressions for partial lower dentures where the front teeth are present I make holes over the last tooth on each side. In this way I am able to remove the impression without distorting it, which is such a common trouble without this precaution. Sometimes I make four or five holes—in fact, wherever there is a tooth standing in such a position that the impression is likely to be distorted by suction in the removal of the impression tray.

Another use for holes in an impression tray is in taking composition impressions for partial upper cases. In this instance I make, in addition to the holes over the teeth, a large number of holes (the same size as before mentioned) all over the center of the palatal portion of the tray. On taking these impressions with composition the trouble we often find is that the composition is inclined to drop away from the palate, and the result is that the plate does not fit; but with holes through the impression tray, some of the composition comes through these holes, and by pressing the composition back through these with the finger the composition is kept close to the palate. The result will be found quite satisfactory; the impression seems to be sharper, and the plates certainly fit quite closely.

FIG. 1.

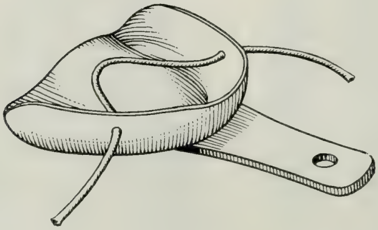
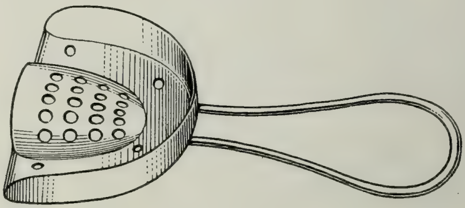


FIG. 2.



Another use for holes in an impression tray is a curious one, but one that I find of very great service to me: In taking plaster impressions of edentulous upper cases I make a hole in the perpendicular portion of the tray, at about the position of each first premolar. Through these holes I place a piece of string, leaving a loop across the palate, as shown in Fig. 1, and then take the plaster impression in the ordinary way. After the plaster gets quite hard I raise the lip and force a little water from a syringe over the top of the plaster above where the string is hanging, and then, with a steady strong pull on the string hanging at the side of the tray, I find I can pull the *plaster away from the palate,* rarely fracturing it at all. This avoids the difficulty of pulling away the plaster with the tray, or what happens more frequently, pulling the tray away from the plaster, and the plaster model having to be removed afterward.

In cases where the palates are V-shaped or very high, the advantage of this method is quite marked.

Incidentally I may mention that I make a rule of having German silver trays made for each case, and I have found that handles of thick wire shaped as shown in diagram No. 2 are more convenient than the ordinary form, in addition to their being easier to make.

20 Grosvenor st., W.

CORRESPONDENCE

The Colleges and the State Boards.

To the Editor of the Dental Cosmos:

Sir,—Feeling sure you are at heart honest in desiring the promotion of the cause of dental education and that the most efficient men may be graduated from every college and university in this country, I trust it may be your pleasure to publish a review of your editorial in the October issue of the Dental Cosmos entitled "The Other Side of the Case."

WHO IS TO BLAME?

First let us admit that the report of the tabulating committee is open to criticism, also that the case of the school which had only one man before one board of one of the states, although the said school had 54 students that year and in the cumulative examination showed a total of 287, was grossly misrepresented. Let us also admit that the state boards are not perfect, and that in some instances they have incompetent and venal men upon them, and as a consequence examinations are not in all cases fair and impartial; that the method of appointing state boards is not perfect, and that errors are made sometimes in selecting men for these important posts;—in other words, that the system of examination and tabulation could be improved.

WHY HAVE BOARDS?

The questions arise in our minds, "Why examining boards and tabulating committees, anyway?" "Why not be without these pestiferous and annoying state examiners, 'poking' their probe into the newly graduated student fresh from the university or college?" "Should these new men with new degrees have to take a state examination and spend from ten to twenty dollars and from four to five days' time going over subjects upon which they have just passed at college?"

THE QUESTION PRESSING FOR SOLUTION.

No doubt these pertinent questions have been asked over and over again by the students, by the examiners, and by the teachers. No doubt, also, there have been those who have desired an answer to these questions, an answer which would be a real solution. Still, no adequate answer has come, and the boards go on examining and the tabulating committee continues to commit its annual offense in its imperfect way. "The whole situation is deplorably bad," and should be corrected.

WHO WILL ANSWER?

By whom? The college? Yes, primarily it is its work, and a work which it has failed to perform, notwithstanding the great and beneficial work which some of them have done; hence the state has had to try its hand in order to protect the public against a flood of incompetent and poorly educated graduates being passed out for the fee.

This may seem harsh, but one has only to recall that a few years ago there were in this country so-called colleges which issued diplomas for the price of fifty dollars to anyone who had the money. One has also to have only a short memory to recall that the examination standards have been raised considerably since the advent of the state board. It may be contended that the standards have been raised in spite of the state boards, which may be a fact in part but is scarcely susceptible of positive proof. I am not ready to admit that the state boards have had no part in forcing the educational standard to a higher plane, since I have in my possession indisputable proofs that they have.

NECESSITY FOR STATE BOARDS UNDER EXISTING CONDITIONS.

It is admitted that "The principle upon which the state board of dental examiners is founded is fundamentally correct and constitutionally sound, that the state has the unassailable right to protect itself against the incapacity of any department of the healing art." It is incumbent, then, upon the state to devise means and ways by which this end may be accomplished—provided, of course, the necessity arises. The fact that the states have provided examining boards would indicate that they recognize the need for such protection in law, medicine, and dentistry, and therefore have promptly created boards of examiners to that end. The state has prescribed how these boards shall be selected and appointed, as well as outlined their duties to the public. It may be and doubtless is a fact that the state has not yet devised a system of boards and provided a review of the work of the college which is perfect. I think it has not.

A PROBABLE SOLUTION.

It would probably be wiser if the state should have a commission properly selected and armed with the necessary power to take over the entrance examinations to the colleges and to supervise the examination of all candidates for degrees, and thus do away with the double examinations so trying and exasperating to the student just out of college. Such a commission should be selected from outside of the teaching faculty of the colleges, and should be as far as possible non-partisan, its members being paid by the state an adequate compensation for services rendered. Such a commission would of necessity have to be composed of men of the highest type and of such ability as to merit the confidence and respect of the profession and the public. The duties of such a commission should comprise general supervision of the colleges as to equipment, entrance examination, and number of subjects to be included in the curriculum, etc., each student who obtained the necessary points to receive a degree to be given in addition to the diploma of the college, the commission's certificate, which should entitle him to registration in his own state without further examination.

THE DENTAL PROFESSION SHOULD WAKE UP.

It is about time that the dental profession should have a heart-searching investigation of the college situation in this country. The cry is more or less persistent for reciprocity. What stands in the way? Why not have it so that a competent and ethical dentist could register in any state by presenting proper credentials as to his education? Why condemn the tabulating committee and the state boards? They do not teach dentistry.

MISTAKES OF THE TABULATING COMMITTEE.

The tabulating committee probably made a mistake in putting the Canadian school on the list of discredits, since it only had one man up for examination. In invoking the editorial from *Oral Hygiene,* why did you not give the editor's remarks in defense of the tabulating committee, in which he says: "Those responsible for the tabulating report recognize the deficiencies of the present system, but without funds to employ a paid secretary it is manifestly impossible for them to do more than report the first examinations, which are the results of much time and correspondence, as all the dental schools are classed under this rule—"It is as fair or unfair to one as to all."

FUNCTION OF THE BOARDS.

The boards were created by the state for the purpose of putting a check, if you please, upon the reckless, irresponsible, avaricious colleges, whose product was more and more a menace to the public and a disgrace to the profession. The state has taken the way it deemed wisest to constitute these boards.

SOCIETIES RESPONSIBLE.

In most cases the state society has much to do with the appointment of the examiners. It seems puerile to cry that the boards are the result of political pull; no reputable dentist is excluded from the state society, college men are gladly received, and most college men are members of their respective state societies—so why not work a reformation and see that proper men are recommended for these important offices. But, "Those who are professional teachers, and therefore by their training best qualified for the work of examining, are specifically excluded by virtue of their teaching connection."

BOTH JUDGE AND JURY.

Now, Mr. Editor, you did not intend to be facetious about this matter. Think of it! The college faculty sitting on a board of state examiners, examining men who have just been handed their degrees by the said faculty a few days before. Could anything be more farcical? The mere mention of such a situation is ridiculous. Why not first do the work right at the source? *Can it be possible for the work of the examiners to be more "deplorably bad" than the work of some of the colleges?* Is it impossible to select from a whole state society five or six men well enough informed to examine students? Who dares to sit in judgment on the whole system of state examination in this country, and say that the system is not a fair or proper test of the qualifications of the candidate for licensure! The system may be and doubtless is unfair to the candidate, inasmuch as it necessitates a double examination, whereas one should suffice.

THE CIVIL SERVICE PLAN.

It would seem from the third indictment that the office of an examiner is a lucrative and much-sought-after job for which it is necessary to enter into political intrigues and work out schemes for personal selfishness and private greed. How can these things be? Will a state society sit supinely by and see such a state of affairs exist? Are examiners paid such sums of money for their time as to make the office one sought after? I dare say that the poorest-paid member of the faculty of any college is paid more than the average state examiner. No, Mr. Editor, you must look elsewhere for the fly in the ointment. The civil service plan you suggest is excellent, but the examination should begin and end with those other than the students, and the civil service examiners should have power to inforce their rules and regulations and to see that dental education is properly imparted to those properly selected.

PUBLICITY SHOULD BE GIVEN ALL EXAMINATIONS.

The widest publicity should be given to examinations, and anyone interested should not be denied the right to review the papers of a candidate who takes an examination before the state board. There should be nothing to conceal. The board and the tabulating committee are doing as far as possible, I think, what they conceive to be right, and their *personnel* will compare favorably with other organizations in dentistry. The time has come when "An institution which continues to graduate year after year men who continuously fail, and of whom 25 to 50 per cent. cannot make their state board examination without further study and coaching, is a disgrace to itself and to the profession." "The time has passed when you can throw a lot of chairs, electric engines, and fountain spittoons together with a sprinkling of poorly paid demonstrators and call it a dental college."

REFORMATION, NOT CRITICISM, NEEDED.

The truth is, Mr. Editor, instead of trying to discredit the tabulating committee and the examining boards, such men as yourself and members of the faculties of the better class colleges and universities should try in every way possible to aid and assist them in their efforts to show to the world what disreputable practices some of the so-called educational institutions are guilty of. Some of them have existed long enough, and should be reformed or put out of business.

CIVIL ACTION NOT LIKELY.

It is quite a remote probability that civil action will be taken by any of the colleges which are tabulated as deficient; it would open Pandora's box and exhibit to the public more than it has dreamed of before. Let the Faculties Association classify its schools; or, failing to do this, do they admit all to be on the same basis? I am positive that some of the members would not, over their signature, make such an admission. It is amazing that the better class of colleges in this country should continually stand for and uphold some practices which are openly and flagrantly carried on in some so-called educational institutions. Reciprocity is very desirable, and the principle is just and right. We should have it, but is it reasonable to suppose that it can be attained with such a deplorable condition existing in our educational system?

H. W. CAMPBELL.

SUFFOLK, VA.

Possibility of Deception in Compared Radiographs.

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—In the article by Paul R. Stillman, D.D.S., in the April 1917 issue of the DENTAL COSMOS, on page 413, are three illustrations purporting to show the regeneration of bone about the root of a lateral incisor tooth. With all due respect to the author, I fear that he has let his desire to prove his point warp his judgment in reading the radiographs submitted. Upon examination it is seen that the radiographs have been made from different angles, thus producing a marked distortion. In his Figs. 3 and 4 the lateral in question measures about the same, 22 mm. in length, but the hor-

FIG. 1.

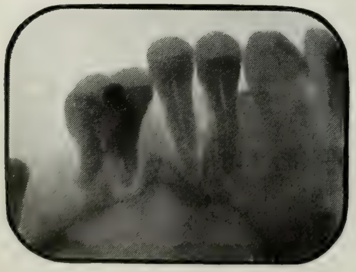
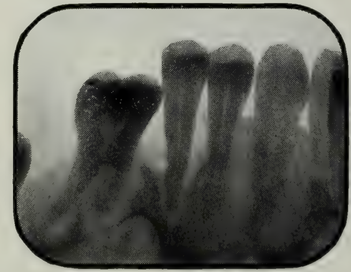


FIG. 2.



izontal angle from which the radiographs were made was quite different in the two figures. In Fig. 5 the lateral measures 27 mm., as against 22 in the other illustrations.

I am not contending that Dr. Stillman did not succeed in producing regeneration of bone about this tooth, but I do claim that the radiographs shown do not prove it to me.

To substantiate my point I inclose two radiographs of the same tooth, an upper right second bicuspid, taken from different angles. In the first (Fig. 1) there appears to be only about 3 mm. of bone investing the apical portion of the root, and in the second (Fig. 2) this is increased to about 7 mm. This regeneration (?) was accomplished without any treatment at all, both radiographs having been made within a few minutes of each other, the apparent increase in bone being due to the fact that the position of the X-ray tube was not the same in each exposure. It will also be seen that the bicuspid in both of my pictures conforms in distortion and amount of bone with the lateral shown by Dr. Stillman, viz, the shorter tooth (Fig. 1 and Fig. 4 in Dr. Stillman's paper) shows less bone about it, and the elongated ones (Fig. 2 and Fig. 5 in Dr. Stillman's paper) show a much larger amount of bone.

Very truly yours,

RAYMONDE A. ALBRAY.

NEWARK, N. J.

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Eastern Association of Graduates of the Angle School of Orthodontia.

Regular Meeting, held in Philadelphia, March 31, 1917.

THE meeting was called to order by the president, Dr. Ferris, at 4 P.M., in the lecture-hall of the Evans Institute Philadelphia, Pa., on Saturday afternoon, March 31, 1917.

Dr. EDWARD C. KIRK of Philadelphia presented a paper entitled "Malocclusion as a Problem in Pathology."

[This paper is printed in full at page 585 of the present issue of the DENTAL COSMOS.]

DISCUSSION.

Dr. Milo Hellman. Some time ago, on meeting Dr. Kirk at a meeting in Philadelphia, he greeted me in this manner: "Hello, Hellman! What brings you here?" I answered, "I heard that you were going to read a paper." If I had been accosted by the essayist today in a like manner, the answer could not have been different. This time, however, there was an additional interest involved; besides enjoying the reading of a paper by him, I was particularly curious to hear his opinion on an orthodontic problem. Some time ago I thought that I had found the place of orthodontia in the realm of medicine, but I have to modify my opinion in regard to it today. I followed Schwalbe in his classification of pathology into nosology, the study of diseases, and disontogeny, that of the science of maldevelopment. I alloted to orthodontia a place in disontogeny. According to the way Dr. Kirk put it today, however, there *is* a pathological side to the development of malocclusion. I think we must accept that.

Furthermore, I wish to indorse *in toto* his claims, and I cannot do it better than by substantiating a good many of his contentions in the way of actual figures. I have here some statistics that may be of interest, which bear out a good many of the contentions of the paper.

Some years ago I began the study of the etiology of malocclusion. I started, as Dr. Kirk said, from the viewpoint of orthodontia. This was done by making the nipple of the bottle-fed baby the bone of contention, but after I had pursued this study for a while, the subject broadened out beyond the nipple, and beyond orthodontia, extending into medicine, and probably into biology. So that the fact of the matter as it stands today is exactly as stated by Dr. Kirk. By experimentation it was found that insufficient thyroid secretion is the cause of disturbances in lactation. This has been proved over and over again by clinical observation also. On account of the inability of the mother to secrete milk and nurse her offspring, most of these children have to resort for their maintenance to the bottle. This fact furnished me a clue toward clinical observation. Only yesterday I looked over the records of a number of cases that I had examined. They numbered 202; of these cases approximately ninety per cent. were bottle-fed children who presented malocclusion of the teeth. Of the 202, 118 had adenoid vegetation, and 102 had abnormal tonsillar growth or atrophy of the tonsils. Some of these adenoid and tonsillar growths had been removed as often as three times, and recurred.

Parallel with this disturbance, we have several other diseases going hand in hand—for instance, measles, which reached a high percentage; whooping-cough is another disturbance which is closely allied in frequency of occurrence to diseases of the tonsils and adenoids in bottle-fed infants; and a third disease is chicken-pox. We also find nervous disturbances, ranging from slight nervousness to chorea, but the other three diseases mentioned go parallel, and run to a high percentage. It seems, therefore, that the whole trouble that lies at the back of the condition is thyroid insufficiency; not only after birth, but we must anticipate, I suspect, that it exists also before birth. It becomes evident, however, only after the child is born, when the mother is put to the task of nursing.

I wish to thank Dr. Kirk for giving us his interpretation of these conditions, and expressing his views in a very instructive paper. I am sure to voice the sentiment of all present when I say that I have greatly benefited by it.

Dr. H. E. Kelsey, Baltimore. I want simply to ask a question. Perhaps I did not get it, but I did not hear Dr. Kirk express an opinion as to whether these cases that are the result of rickets, cases of V-shaped arch, for instance, which he classified as being the result of rickets, and other cases that are the result of some constitutional disturbance, are to be regarded as susceptible of successful treatment by ordinary orthodontic means. I should like to know, for instance, whether or not, after these children had arrived at the age of thirteen or fourteen years and were the victims of these disturbances, they would be amenable to ordinary mechanical interference.

Dr. Kirk (replying to Dr. Kelsey). That is a very interesting question, but it is one for the orthodontist to answer. I can only speculate concerning it. You will notice that I made quotations from several writers who have presented their views as the result of their clinical observation and study of these cases, and they seem to agree in the opinion that rickets is a disease which, ordinarily speaking, completes its devastation at a certain period of life. One of these writers places this period at the age of five or six years, but a subsequent writer, Williams, says that while this is commonly true, in certain cases it is active until a period just approaching puberty. He also says that the manifestations of the disease, so far as its sex relations are concerned, are absolutely the same for both sexes up to that period; but that when secondary sexual changes occur at puberty, one must make a distinct division between the sexes. The boy, at puberty, recovers fully; but the girl is likely to show an exacerbation of the condition of rickets, such as Marfan refers to as delayed rickets. This also suggests an influence exerted through the ductless-gland system on body nutrition as a factor in rickets. Leonard Williams accounts for the observed differences in the behavior of rickets as related to the sexes on the ground that there is a harmonious relation between the testicular secretion and the thyroid; whereas ovarian secretion is in some way antagonistic to thyroid secretion, bringing about functional disturbances in the thyroid and parathyroid, which are expressed in imperfectly balanced growth force and development.

The comment of Marfan is interesting, that a bad case might be referred to the dentist for orthodontic treatment, but that the dentist could change only the direction of the teeth, and not the form of the arch. The orthodontist at present, with the modern appliances, can, as we know, move the tooth bodily. At the time Marfan's article was written this procedure was not known.

Dr. Hellman was on the right road when he said that his search for the beginnings of malocclusion finally led him to the point of the nipple, and that it was the nipple that dominated, at least in the beginning, the molding of the infantile mouth. It seems, however, that it is not the nipple itself, so much as what passes through it, that counts; for if the writers whom I have quoted are right it is the failure of the mother to furnish a sufficiently thyroidized milk supply that prevents the proper osseous development of the child, so that the imperfectly calcified and abnormally plastic jaw is molded as it were around the nipple form by the extrinsic force expended upon the maxillary arch in the act of sucking. The trouble began in malnutrition. It was not primarily mechanical, but physiological.

Dr. B. W. Weinberger, New York. I am more than pleased with the paper Dr. Kirk read this afternoon. It shows a careful study of the literature, and I wish to thank him personally for the time and effort he has spent in preparing it, and also for presenting it before our society. This is only another evidence of the fact that we must delve deeper into the etiological factors that produce malocclusion of the teeth and maldevelopment of the dental arches.

We have previously had sufficient proof presented for us to realize that there are important prenatal factors influencing the development of the facial area and causing malrelation of the dental arches prior to birth, and although I have suspected that the internal secretion plays an important part in causing malformations, the part attributed to the pituitary gland I believe has been overestimated.

This is really the first time we have held the thyroid to account, especially as definitely as Dr. Kirk has done today. I believe, too, that there is a lack, as well as an overproduction, of thyroid secretion at the root of a great many of our cases.

I wish to emphasize one point that Dr. Kirk did not dwell upon, hyperthyroidism. We must be careful in diagnosing our cases in recognizing a manifestation of hyperthyroidism that is apparent around the age of puberty.

It is surprising to me the number of cases of hyperthyroidism that have been brought to my attention this winter—typical cases, with normal mesio-distal relation of the first molars, but with an increase in bone growth, creating space between all the teeth. This has been especially apparent in the maxillæ in the premolar region.

By closely observing the conditions in three cases, hyperthyroidism has been brought to light. In one case recently, upon noticing this marked growth, I called the family physician's attention to it, and after a thorough examination of the child, he discovered this to be the case. Strange to relate, the mother of the child was being treated for hyperthyroidism at the time, and although the child had been under the physician's observation constantly, he had failed to recognize the condition until his attention was directed to it. The separation of the teeth and overdevelopment of the dental arches were the first manifestations. The result was that the child was taken care of immediately, and the condition brought under control instead of being allowed to run its course.

There are undoubtedly a number of such cases in which we attempt to close these spaces without realizing the importance of that point.

Dr. H. C. Ferris, New York. Dr. Kirk asked for our opinion regarding impaction of the third molars. I might say, with reference to that particular point, that several cases have been corrected in my hands by a consideration of the position of the entire arch to the center of the skull—carrying the teeth on the side where the impaction occurs mesially, and liberating the impacted molar. I am now at work upon the case of a child where the second molar of the same side had been impacted in the mother's mouth. I believe this to be a coincidence, but it may have been due to the same cause.

The reason for this unilateral underdevelopment will have to be more carefully studied. It may be due to habit, but it is my belief that loss of function on that particular side of the mouth is the most general cause. A devitalized deciduous tooth or root, carried for a year, causing the child to chew on the opposite side of the mouth, invariably results in this lack of development.

Dr. J. V. Mershon, Philadelphia. During the last two years I have been making clinical observations, inquiring very carefully into the case histories of children presenting themselves for treatment at my office with marked defects of the maxillæ, and without a single exception up to the present time, so far as it has been possible to get the history from the children, their parents, or the physicians, I have discovered that these children have had deformities in their hands, their legs, their ribs, or their backs, or have had evidences somewhere of osseous deformity. The histories that we get in such cases from the children, the parents, and even the physicians, are very imperfect and inaccurate, and I wish the members of this society would undertake an investigation of this phase of the subject. I believe valuable data could be obtained if the members would do this and record the facts discovered.

There is one thing further that I should like to speak of along the line of reflexes. In a case reported before the society last May, in which impactions had produced marked physical and mental derangements in a young man, the deciduous teeth were removed, as they seemed to be the cause of the retarded eruption of the permanent teeth, with the result that the mental and physical conditions were improved. Then, in placing the pin and tube appliance, I put on more pressure than is usual in orthodontic work, as I did not expect to see the patient again for several weeks, and immediately thereafter his old condition returned.

Dr. Ferris. One more point before calling on Dr. Kirk to close the discussion. The whole trend of his thought and that of the men whom he has quoted is toward the medical man's point of view, *i.e.* medication. I do not believe that there is one man in the room who would, except in very rare instances, resort to medication during the handling of any of his cases of orthodontia, but we frequently need the assistance of the physician, and should be well versed in the general principles of practice in advanced medicine.

I feel that the work we are doing is sometimes marvelous in its physiological effects locally, also in its influence upon the nerve reflexes of the other organs of the body. Might it not be possible, in cases such as we meet in our daily practice, that a mechanical stimulation of the dental parts would result in an increased circulation to the upper thorax and to the ductless glands, producing a greater ability on the part of the child to nourish itself through its own food? That these cases may be treated without medication we have proved, and we have recently seen reports of some disastrous records from thyroid medication. Of course we all want to hear both sides of any subject, but it bids us pause, when we attain such good results through stimulation, and finally through function. I am a great believer in the power of the jaw, and its kingship over the reflexes of our alimentary canal. When we are better able to prove scientifically some of the findings that we are recording through clinical observation, I believe we shall receive more recognition from our standpoint.

Dr. Hellman. I just want to say a word in relation to what Dr. Mershon said, that in association with deformities of one part of the body there will be corresponding deformities in other parts the evidence of which has not been gathered. I wish to say that I have gathered some evidence, and that it is in the affirmative. We do find a correlation between these. For instance, we have deficiencies of the alveolar processes, and also have a deficiency in development of the osseous structure in other parts of the body. I have some evidence that will be published shortly bearing on this point.

Dr. Kirk (closing the discussion). I should like to say one or two things. In the first place, I want, above everything else, to avoid creating the impression that what I have presented in the paper is presented in any dogmatic way. I do not know how much the rest of you have been troubled in the same way, but I have found the teachings of Talbot concerning degeneracy one of the most difficult things I have ever attempted to comprehend, yet I do not want to abandon it, because I believe that there is a foundation of truth in his teachings. But what is it? When he has written of dental irregularities he has always mentioned the factor of degeneracy. Maybe he is right, but degeneracy is susceptible of a variety of definitions.

When I began to study the maldevelopment of bone from the point of view that I have presented today, I commenced to see some light on the subject. Therefore, I have tried to line up, as it were, some of the evidence, and present it in somewhat consecutive order, so that we might establish a different point of view, and see what there is in our problem of malocclusion besides its mechanical features. When I am asked about the ductless glands, I have the feeling of being lost in a fog of uncertainty. As a matter of fact, the whole question of ductless-gland activity—not only the individual glands, but also their relationships—is in almost a chaotic state. Nevertheless, in the subject, it seems to be true that we have found the general explanation of certain aberrations in development. In these cases of failure of normal osseous development in the jaws, there is collateral lack of development elsewhere; so we get a complexus of symptoms having a common origin, as representing the central nutritional fault behind it all. Along that line of evidence of maldevelopment has been observed the particular kind of thing that Talbot has talked about from the standpoint of degeneracy, the condition we have referred to for years as the V-shaped vault or the Gothic arch. I hesitate to classify it technically in this body, but all know what it is and where to place it in the Angle classification.

It is undoubtedly true that in attacking the problem—as we have, almost wholly—from the mechanical end, and working by mechanical means empirically, for the purpose of restoring the occlusion so as to bring about the normal functioning of the masticating mechanism, we have often accomplished good results, in regard to the general health of the patient, even though we may have had no other ideals than that. We move the teeth, but we accomplish more than we anticipated. We correct the malocclusion, and incidentally often correct disorders of a nervous character that are symptomatic, and I am almost ready to say pathognomonic, of that stress upon the nervous system due to the physical peripheral irritation of the nerves which have their endings in and about impactions of the teeth. That is one condition that is eliminated when the teeth are restored to normal occlusion. You correct nervous stress, as definitely as you would do it by removing an impacted second molar by a surgical operation when such a tooth has been the source of nervous irritation resulting in reflex disturbances. In some, this irritation may manifest itself as spasmodic trouble or interference with the special senses, the hearing or the sight; or as chorea, or epilepsy, or insanity. We are justified in this view because we have now a sufficient number of records of cases that have recovered from these disorders when these dental defects were eliminated.

It is interesting to note that these pathological phenomena in the way of nervous disorders or in the way of enlarged tonsils, adenoids, and other things, develop consecutively, in relation to the maldevelopment of the jaw itself; and we seem to be confronted in this situation by the condition that we call the vicious circle—for if we correct the malocclusion we eliminate the one factor toward which the whole organism is reacting abnormally.

Dr. Weinberger's reference to thyroid treatment is very pertinent. I was very much interested in the discussion of this question by Ewan Waller, who got his inspiration from Leonard Williams. Waller pointed out particularly that there may be hypertrophy or enlargement of the thyroid, in women especially, of two different types: In one the gland itself is producing an excessive amount of secretion, with enlargement of the body of the gland, the intensification of its function causing the excessive amount of secretion. In this case the infant becomes affected, because it is getting too much thyroid in its milk. There is another goitrous condition, however, in which the function of the gland is destroyed. Thus it appears there may be an enlargement of the gland with a decrease of function, as well as an enlargement with an increase of function; and it therefore requires careful differential diagnosis to avoid doing the wrong thing to the child being nursed by a goitrous mother.

I do not want to record myself in your minds as having brought here one of the cure-alls for cases of orthodontia. I have merely tried to line up this evidence from literature and from clinical observation, and to present for your consideration what seems to me to be a most fascinating field of research, one of the fertile fields of study that may possibly furnish the open sesame to a tremendous development in orthodontia itself. What I have presented is merely suggestive.

On motion of Dr. MERSHON, the thanks of the society were extended to Dr. Kirk for his paper.

The society then adjourned.

Harlem Dental Society, New York City.

Regular Meeting, held January 18, 1917.

A regular meeting of the Harlem Dental Society was held on Thursday evening, January 18, 1917, at which time a paper was read by Dr. Henry Schwamm, New York, N. Y., entitled "The Dentist Before the Law: An Analysis of the Legal Aspect of General Anesthesia in Dentistry."

[This paper is printed in full at page 611 of the present issue of the Cosmos.]

DISCUSSION.

Dr. M. I. Schamberg. *Mr. President and gentlemen,*—I think that a paper of this character will do some good, although I must take exception to the statement of the essayist that the dental graduate has no legal right to administer anesthetics. I believe that in these days, when all dental schools have in their curricula a course of instruction in the administration of anesthetics, when one passes the dental state board examination with a view to showing his fitness to administer anesthetics, his acquaintance with the attending dangers, and his ability to cope with such emergencies, and when he has qualified as a dental practitioner after having been instructed in anatomy, physiology, materia medica, and the allied subjects, he has by virtue of such preparation the legal right to administer general anesthetics for dental purposes. I believe that right has been extended in some states, as indicated by the essayist; where members of the dental profession have become proficient in the use of nitrous oxid, either alone or in combination with oxygen, they are permitted to administer prolonged anesthesia for all types of surgical operations. Regular practitioners of dentistry are in the same position as their medical *confrères* as regards mishaps under anesthesia. If a well-known specialist in nitrous oxid anesthesia, whether he be a physician or a dentist, is called in to administer N_2O, he would be considered blameless in the event of an accident, unless there was direct evidence of carelessness in his method of administration.

The subject of the paper is of interest from more than one standpoint, particularly as it refers to the limited training of dentists in the fundamental principles of medicine. I am impressed more and more with the close association of one's dental welfare with the general health, and it seems to me that men who have devoted three or four years of study in the specialty of dentistry should be legally empowered to adopt any means of treatment, including the administration of general anesthetics, as are their medical brethren who have studied no greater length of time in preparation for other specialties, such as ophthalmology, otology, gynecology, etc. I believe the time will arrive—and it is not far off—when every dental practitioner will become a graduate of medicine before specializing in dentistry. Such laws as may apply to the future practice of dentistry would not in any sense interfere with the rights of you men who are already licensed practitioners.

Certainly, in the light of recent research and its indisputable findings other portions of the body are no more closely related to the general health than is the mouth and its component parts. In fact, I am inclined to believe that focal infections of the mouth are more closely associated with lesions in remote portions of the body than are diseases of the eye, ear, nose, throat, etc.

I do not wish to get too far off the subject, but I do want to refer to the fact that no one can give you the moral right to attempt to do anything that you are not capable of doing. The legal right is unimportant as compared with the moral right. A man may be a graduate of medicine and yet he would not have the moral right to administer anesthetics unless he could do so with reasonable safety to his patient. Most physicians are not as well qualified to administer nitrous oxid and oxygen as are those dental practitioners who have made this work their specialty.

At the postgraduate hospital we have nurses who are trained to administer anesthetics, and they do it far better than most physicians. Owing to their proficiency, they have the moral right, whether the legal right has been established or not. I do not believe you can deprive anyone of a just right simply by word of law. Many a man has been sentenced to death because the law says, "Thou shalt not kill," yet many an individual has escaped the electric chair or the gallows through the unwritten law; in other words, the jury has decided that the moral right should prevail. The same principle applies in medicine or dentistry. A dentist may have the N_2O outfit in his office and seldom use it. A patient comes in for an operation and insists upon taking N_2O, and it is administered without due precautions. If that dentist gets into trouble, the chances are that the courts would be justified in punishing him even though he had the legal right to administer anesthetics. A specialist in that line of work who gives anesthetics every day and is well acquainted with its dangers is liable to have accidents happen, but I defy any lawyer, no matter how clever he is, to get a jury to condemn that man. We all know the possibilities of dangers that may arise, very often through no fault of the practitioner. I speak of this simply to show that men are not infallible in their work, and things may go wrong for which they are not responsible, but I do feel strongly with the essayist that no man has a right to do this class of work unless he has thoroughly prepared himself for it, irrespective of whether he has or has not the legal right.

When I discuss this subject, however, I feel as though I were kicking a fellow who is already down. Nitrous oxid is far from being in the ascendancy at present, owing to the newer methods of applying local anesthetics in our work, particularly novocain. I speak of this because the greatest danger in the use of N_2O is not the danger due to a high mortality rate, but because one's work is hurried and at times incomplete owing to the evanescent character of the narcosis. In other words, it is not a suitable anesthetic for the class of work that most of us are doing today in mouth surgery.

In days gone by, almost as soon as a person had a toothache the tooth was extracted, and often only one at a time. Under those conditions, N_2O was as good and as safe an anesthetic as any, but today we encounter broken-down teeth with infected areas about them which require curetment, treatment, etc. Under such conditions, conductive anesthesia with novocain is the far more suitable anesthetic. I do feel, however, that there are occasions when general anesthetics need to be employed by the dentist, and for that reason I do not believe he should be denied the right to use them. Up to the present period of dental progress, we have not quite reached the point where the dentist is fully medically educated, but I believe that this should not deprive him of his right to employ general anesthetics. In my practice, as in many others, occasions arise when local anesthetics are not so suitable as N_2O or ethyl chlorid. Anesthetics in dentistry are essential to good and thorough work, and it rests with the dentist to select the best method for each individual case.

Dr. H. S. Dunning. I believe that this paper is going to do a great deal of good. It is a very interesting paper from my standpoint, and one that describes the present conditions very well.

Nurses are giving anesthetics better than many doctors. Anesthetics should be given by expert men who are doing nothing but that, and are kept busy in this field all the time. In all leading hospitals that I know of, for instance, St. Luke's, the Presbyterian, and others, all the anesthetics in the operating rooms are given by trained nurses. I feel that the dental surgeon receives inadequate training, and should not be allowed to give any general anesthesia unless he is qualified to do so by some sort of a postgraduate course such as the hospital intern takes.

Why should a patient go to a dentist and say, "I want to take gas, Doctor," any more than a patient should go to a rhinologist for a delicate nasal operation and say, "I want to take gas, Doctor." The only answer is that it has been the custom.

It is an old custom to have a tooth extracted with gas. Many cartoons have been published picturing a dentist with one foot on the patient's chest, pulling out a tusk, and the patient tearing the dentist's office to pieces. Does a patient tell a surgeon what kind of anesthetic to use? No. The surgeon tells the patient. I have lost, I think, two patients in the last year by refusing to give N_2O in cases of extraction. Extraction of teeth is a dissection, and should often be done with great deliberation.

The average student graduating from a dental school does not have an opportunity to give over half a dozen administrations of nitrous oxid; after that he gives it in his office without concern. What does the average dentist know about the physical condition of the patient for whom he is operating?

Every dentist can qualify in the use of general anesthetics as well as a nurse can if he is really in earnest. There are too many gas-and-oxygen experts—oral surgeons over night—without proper training. Every dentist should qualify himself by constant clinical training.

One often has to work very rapidly while administering gas; ether gives you more time. A simple operation is often made difficult from the administration of a general anesthetic by a poorly trained anesthetist.

I agree with Dr. Schwamm when he says that about 90 per cent. of all dental operations can be performed under local anesthesia, and about 90 per cent. of all oral surgical operations can be more carefully performed under local anesthesia. Perhaps from 5 per cent. to 10 per cent. can be better done under general anesthesia. These are divided into three classes: (1) Very young children; (2) severely infected mouths, and (3) ankylosed jaws. These cases often need hospital care.

Analgesia under N_2O, I believe, is a thing of the past. I do not know a single dentist at present who is using gas in this manner. Such practice is dangerous and unscientific, and should not be used except when absolutely necessary.

My objections to general anesthesia are that there is (1) danger from the anesthetic itself; (2) more hemorrhage; (3) more mucus and saliva; (4) more trauma to parts operated upon; (5) often not enough time if the patient does not take the anesthetic well.

The remedy is to have dentists trained in surgery, and this means in schools connected with large universities or medical schools and in hospitals. Nurses give anesthesia splendidly in many hospitals, but they are carefully trained to do such work.

Dr. Theodor Blum. The essayist's paper deals with a very important subject. About a year ago the State of Ohio enacted a law by which students were given the legal right to administer any general anesthetic. This in my opinion was not only an unnecessary, but also a dangerous step. In his daily practice a dentist can safely employ only one general anesthetic, if at all—and that is nitrous oxid or nitrous oxid and oxygen—and at the same time perform his operation, but even this is dangerous.

A dentist is licensed by his state to practice dentistry and not general anesthesia.

In my opinion a dentist has just as much right to employ a general anesthetic as a physician—that is *none*, except in case of emergency. To give a general anesthetic as a routine measure, both dentist and physician should have special training which will give them the moral right to administer general anesthetics. On the other hand, we must not forget that for the majority of cases we have a safer and more satisfactory method in conductive anesthesia.

Dr. Leon Harris. It seems to me that the essay of tonight may be discussed from two points of view, the moral aspect and the legal aspect. Mark Twain in his last and posthumous work, "The Mysterious Stranger," says that man differs from the higher animals, the brutes, in possessing the moral sense, and then continues to define the moral sense as the ability to distinguish between right and wrong with full liberty to choose either. It is so with the administration of nitrous oxid; we know whether it is right or wrong for us to administer it, and we have full liberty to choose either, so we choose to administer it. The cases quoted by the lecturer where the administration of this anesthetic was fraught with bad results has had at least one good result; it has shown us that no anesthetic should be considered one hundred per cent. safe. But now we come to the legal point of view, for that is the thing that will put the fear of God into our hearts more than the moral consideration. The essayist has laid down the proposition that no man is qualified to administer an anesthetic who is not qualified to perform a laryngotomy or a tracheotomy. If that proposition holds, then I think that most physicians become automatically disqualified from administering any anesthetic. Of course they have the legal right to perform a tracheotomy—in fact could do it in an emergency, but if, as the lecturer has further said in his essay, the courts take the ability of the best in the profession as the standard of efficiency, then the physician is not qualified to perform that operation, for the standard would be that set by the best tracheotomists of the Willard Parker and other hospitals. I am not making a plea for the extensive use of nitrous oxid in oral operations. Personally I loathe the anesthetic, and in view of the fact that we have such efficient substitutes as conductive anesthesia, I think it should be used less and less as the latter is more understood and appreciated. The rapidity with which one has to work with nitrous oxid and the slovenliness of the work that necessarily follows are in themselves enough to condemn it. Dr. Schamberg has proved to the most skeptical that simple extraction of teeth, especially those that show apical infections, is not sufficient *per se.* To do the work satisfactorily it must be looked upon as a surgical procedure, that is, the extraction of the tooth is only the beginning. The socket must be thoroughly curetted and treated surgically. Compare that to the hasty and crude method that nitrous oxid compels one to adopt. I remember yielding to the request of a brother dentist recently to extract thirty-two roots under nitrous oxid anesthesia. At the first administration I slashed away and got three out, at the second administration I managed to get two more out, and then I balked. I demanded that the patient be given conductive anesthesia or be butchered by someone else. She chose the latter and I lost a friend. The bleeding, with the gurgling sounds in the trachea, the cyanosis with spasmodic action of the muscles, and the absolutely unscientific manner of doing the work, are hindrances calculated to discourage the most ardent supporter of that anesthetic. Of course there are cases where it may be reasonably employed. In single and easy extractions, in very nervous individuals and in children, in acute alveolar abscesses where injections are impossible and dangerous, in conditions of trismus where the patient's mouth has to be prized open under a general anesthetic, it may reasonably be employed. I would like to ask Dr. Schwamm whether he said that the courts take as a standard the ability of the best and ablest in the profession, or that of the average practitioner.

Elmer C. Miller, A.B., LL.B. Since I am a mere lawyer and not a dentist, I shall have to confine myself to the legal aspect of the subject as laid down by the essayist tonight. I think, however, as a legal proposition, we may say that a dentist has a right to administer general anesthetics, although this right may not have been declared in so many words by any court.

When you were licensed to practice you were licensed to do the things generally done by a dentist. It is common knowledge that for many years dentists have practiced the giving of general anesthetics. It would seem, therefore, that as a dentist you have the legal right to administer general anesthetics.

The general rule of the liability to which a dentist is held by the law is this: The dentist is required to possess the ordinary knowledge and to exercise the ordinary skill of the average dentist in his community. However, if he is performing a difficult and dangerous operation, the skill required under such circumstances would be greater, from the very nature of the case, than it would be in a case where there is no special danger involved.

Now, it appears that dental science has shown that there may arise a number of complications in the administration of general anesthetics, resulting in situations which would require the knowledge and skill of a physician, such as those where a tracheotomy operation is necessary.

In view of these facts it seems to me that if a dentist should be so unfortunate as to have such a situation arise during the administration of a general anesthetic, resulting in some injury to his patient, a fair question may be presented in an action for malpractice as to whether he has not been guilty of negligence, because he has undertaken an operation which might result in complications that by training and skill he was unable to treat.

Another consideration is that while the dentist is required to possess only the ordinary knowledge and skill of the average dentist in his community, he must nevertheless keep abreast of the times, and as the general skill and knowledge in his neighborhood advances, the standard of knowledge and skill to which he will be held also advances. The statement that in 90 per cent. of the operations a local anesthetic would be safer and would give the same results as a general anesthetic appears to me to be very important. If that be the case, in an action for malpractice where an injury has followed from the use of a general anesthetic, the question might well be presented to the jury as to whether in using the dangerous method instead of the safe method the dentist exercised the general knowledge possessed by the average practitioner in his community.

It seems to me, therefore, that while the dentist may have a right as a theoretical proposition to administer general anesthetics, nevertheless, as a practical matter, he should not administer general anesthetics unless he is also a physician and surgeon. If he administers a general anesthetic with unfortunate results, an action for malpractice is reasonably certain to follow. He may possibly successfully defend the action, since the defendant usually wins in malpractice cases, but even if he does prevail, he has been under a great nervous strain for a considerable period of time in anticipation of the trial, and also under a greater strain during the course of the trial, which often lasts for two or three days. On the other hand, if the jury should indulge its natural sympathy for the injured person and find against the dentist, it means a blot on his career which will not be eradicated for many years. It would seem, therefore, the part of wisdom for the dentist to forego his theoretical rights in the interests of his peace of mind and professional standing.

Dr. Schwamm (closing the discussion). I feel highly honored by the result of this discussion, and by the number and caliber of men who took part in it. While some of the speakers tried very hard to disagree with me, they nearly all agreed with the substantial points of this paper.

Dr. Schamberg failed to distinguish the conditions under which nurses are administering anesthetics. They merely assist the surgeons after the patient has been properly prepared. Their employment for this work is mainly due to economic reasons, not to any superior ability. But there is a growing movement in the medical profession against this practice, and if a test case came before the courts it is doubtful whether it would be upheld. In a sense the nurse stands on a higher level before the law than the dentist: her scope of authority has no such narrow limitations, and she enjoys the privilege of secret communication which the dentist does not.

Dr. Harris wants to know whether only one possessing special ability has a right to give anesthetics. Technically this is so. To make this point clearer, let us compare the practitioner with a railroad. A train, as you know, is only required to follow general rules out on the clear road, but when passing a crossing it must observe special rules, *i.e.* announce its approach, and go at a certain speed; the crossing must be specially constructed and guarded. In a word, all possible precautionary measures tending to insure the safety of the public must be observed.

Mr. Miller's attempt to disagree with me was at first surprising. For about six years he has been a loyal associate, and in legal matters I have never known him to oppose me—in public. I doubt very much if his statement that your right to this practice is based on custom or precedent would be upheld by a court or jury acquainted with the present state of medical knowledge. Not so very long ago old and feeble-minded women were sentenced to death for being witches. So you see that, in spite of some evidence to the contrary, the law is progressive. Even the man who claims to have a legal right to beat his wife has some difficulties at present. Assuming that we have the legal right to give anesthetics, ought we make use of this right with our present qualification? I think it would bring us near the spirit of Shylock, who insisted on cutting off a pound of flesh from a man's breast because he had a legal right thereto. The law is constantly striving to square itself with morals based on practical life and enlightened public opinion. The test of a law, therefore, is not what *has* been done under it, but what *may* be done under it.

The society then adjourned.

Northeastern Dental Association.

Twenty-second Annual Convention, at Hartford, Conn., October 11, 12, and 13, 1916.

Wednesday—*Morning Session.*

The twenty-second annual meeting of the Northeastern Dental Association was called to order in the Foot Guards Armory, Hartford, Conn., at 11 A. M., October 11, 1916, by the president, Dr. Albert E. Cary, Hartford, Conn.

The first order of business was the reading of the minutes of the previous meeting. This was dispensed with on account of their having been printed in the Transactions as distributed to the members.

Dr. F. T. Murlless. Many of our strongest men have been led to make dentistry their vocation—I use the word advisedly—through the influence and personality of practitioners who have through their earnestness and worth impressed these men with the dignity and usefulness of our profession. We need more such, and with the developing need the scope of dentistry has come to demand the efforts of men who have enjoyed the highest benefits of environment and education—for such dentistry is almost a missionary field.

With these facts in mind I move that we empower our president to appoint a committee to formulate a plan by which the association shall establish a scholarship, the requirements and restrictions of which shall be so framed as to attract the finest available material, and the awarding of which shall be regarded as a signal honor to the man upon whom it may be conferred.

The motion was carried, and the President announced that he would appoint the committee at a later session.

The Secretary presented to the society the following communication from the Association of Military Surgeons, suggesting legislative action with regard to the dental corps of the army:

> Hereafter the dental corps of the army shall consist of commissioned officers in the several grades as authorized for the medical corps who shall have the same rank, pay, and allowances as officers of corresponding grades of the medical corps, including the right to retirement as in the case of other officers, and there shall be for every seven officers of the medical corps authorized by law one officer of the dental corps. Dental officers shall be proportionally distributed among the several grades as in the medical corps, and their promotion shall be governed by the laws governing promotion in the medical corps; provided, that examining and review boards shall consist of one medical and two dental officers. Immediately following the approval of this act all dental surgeons then in active service shall be re-commissioned in the dental corps, in the grades herein authorized, in the order of their seniority and without loss of relative ranks in the army.

Motion was made and carried that the association indorse the recommended legislation as offered by the Association of Military Surgeons.

Motion was then made and carried to adjourn until the afternoon session.

WEDNESDAY—*Afternoon Session.*

The meeting was called to order at 4 P.M. by the first vice-president, Dr. David Manson of Burlington, Vt.

Dr. ALBERT E. CARY of Hartford, Conn., read the President's Address, as follows:

President's Address.

By Dr. ALBERT E. CARY, Hartford, Conn.

Members of the Northeastern Dental Association, ladies and gentlemen,—It is my privilege to bring to you a message, and to offer for your consideration and action a few suggestions which, if adopted, will in my judgment be for the present and future advantage of our association.

I speak thus boldly, feeling that you, as well as I, cherish our association, and will welcome any measures that will tend to establish it on a firmer and more satisfactory basis.

I now present for your deliberation a plan whereby this society may eventually become independent and self-supporting. Dental societies, as a rule, are dependent for their revenue upon the annual dues from their members and the income derived from the rental of space to dental manufacturers and exhibitors in general during the time of the meetings. The executive officers in charge are therefore frequently embarrassed in that they have to look only to these two sources for their revenue. To be sure, this mode of procedure can be carried on indefinitely; but it is my idea and wish to make *this* dental society more dignified in character. The time may come when the dental society may not have as a source of revenue the help of the dental manufacturer; even now, they are giving exhibits under the direction of the Manufacturers' Club, and in time may deem this a sufficient appearance, as a body, before the dentist; then indeed it would be gratifying to be assured that we have sufficient funds to carry on our meetings without this aid. My plan is this: To save each year an amount of money such as the treasury will allow, investing it so that it will bring in as high rate of interest as is consistent with safety. Like all individuals, clubs, societies, or even in business, savings are started in a small way, but the individual, club, or society that persists in saving will find, sooner than was anticipated, that they are possessed of more capital than was at first thought possible. This society can, in my opinion, place in such a fund not less than two hundred dollars a year. This may seem a small sum to begin with, and little income can be expected from it, but you will readily see that if this sinking fund is protected in our by-laws in such a manner that the principal cannot be used, it might be an incentive to some of our more fortunate members to make personal contributions to the fund. I would also suggest and urge that all members remember the society in their wills, even though the amount bequeathed be not large.

This proposition is in the line of progress and preparedness, questions which today are being considered in all lines of business and domestic living; and while to my knowledge there is not a dental society that has carried out this scheme, let us discuss with all seriousness its feasibility. To begin with, let us elect or appoint a finance committee, and also offer an amendment to our by-laws that will cover the ground, and present it at this session, so that next year we can vote upon it. It would be possible at this meeting to pass a resolution applying to the fund such an amount as the finance committee may see fit to allow.

Your attention is directed to the National Relief Fund, and while this fund is for a specific purpose, namely, for the relief of members who have been unfortunate financially and are in urgent need of monetary aid, the fund that I suggest for this association to establish is more in the nature of a contingent fund, that is, for such expenditure as the association deems fit at its annual session.

You will notice that this is the twenty-second annual meeting; now, had this fund been inaugurated when the society was first organized, you can readily see that at this time we should be in possession of quite a nest-egg.

At this point I wish to quote from Governor Holcomb:

> Daily across the seas men and women are offering themselves to a bitter fate, are humbly laying aside wealth and honor and position for the grim suffering of war. For us the call is yet faint; largely we go about our usual ways, we even profit from the untoward circumstances of other peoples. We are prone to wrap about us a mantle of smug content, yet distance should not dull our sympathies to others' pain, nor blind our eyes so that we see not how they are fighting to uphold for us the standards of human progress; nor should we forget that the future is big with possibilities that we too must assume the red badge of war.

This quotation ably brings before you our position and sympathies with the unfortunate soldier, and those left at home, in the terrible strife abroad. Our dental journals have pictured to us perhaps more perfectly than to the general public the really awful things that happen to the fighters, particularly in a dental way. You will appreciate our having secured for our program an essayist who will tell us more than we can learn by reading, one who has had recent experience in the hospitals in France. Friday morning Dr. Herbert L. Wheeler of New York will address you, his subject being "What Dentistry has Done in the Present War in Europe."

It would be remiss in me if I did not mention to you at this time how ably the officers and committees have worked for the benefit of this meeting. Those of you who have had experience will appreciate this fact, and I take this opportunity of thanking all of these workers for their kindnesses to me and for their very efficient help.

DISCUSSION.

Dr. F. T. Murlless, Jr., Hartford, Conn. Our president has struck a note in his address which cannot help but hold our attention. The idea which he presents is novel, and deserves thorough discussion, both on its own merits and because we are brought by it to the consideration of the future policy and prospects of this association.

Through circumstances in which I was particularly fortunate, I was able as a lad to make the acquaintance of many of my father's friends in the Connecticut

Valley Dental Society, which for years previous to its being merged in this association was strong in its influence and ideals; in fact, as could not have been otherwise, it reflected the character and force, the earnestness and hopefulness, the intelligence and singleness of purpose of a group of pioneer spirits—a few of whom I rejoice to say are still with us. These men were among the makers of our profession, high in the councils of their professional brethren. To have been led to recall them in this connection has been to me a blessing. Half forgotten impressions have been recalled, and like the odor of lavender perfuming a chest full of precious and hallowed possessions, there still hover in my mind fond memories of these strong and devoted spirits.

We who are members of this association today are the trustees of large responsibilities in the heritage which we have accepted.

Self-preservation is the first law of nature, and by virtue of that which makes us men as well as physical beings we are led to extend our forethought and self-protection to the persons we love, and still more fortunately, to the ideas we hold and to the things which express them.

As an expression of this broader view and the forward look which with these pioneer fathers of ours was often prophetic as to the possibilities of their chosen profession, I am heartily in accord with our president.

Along with this let us focus our glasses on the waters before us, and look hopefully for the beacons which shall mark our progress in the ensuing years. Whither we are tending is not alone for us to consider, but how we shape our sails, that all of the godspeed of favoring winds may be ours, not only that shoals may be avoided, but that our craft may carry her cargo far, is for us to ponder.

May we not only exercise thrift and financial forethought for our association, but shall we not also individually and collectively see to it that fitting successors shall be provided for the responsibilities which we hopefully sustain?—see to it that the type and degree of educational preparedness of the men who in the coming years take up our beloved profession shall be such as to insure the fulfilment of the hopes and dreams of those who have gone before?

Dr. C. Frank Bliven, Worcester, Mass. When I was fortunate enough to be president of this association a number of years ago, I proposed a plan that if put into execution I believed would be of great benefit to the association, but the committee that reported on the paper condemned it with the statement, "We believe that Dr. Bliven is a very bright but impractical man." I think Dr. Cary's plan is quite feasible, provided it be wisely executed. I suggest that he appoint a committee and act as its chairman, if his suggestion meets with the approval of the association. After many years of personal experience with the exhibitors, I have no fear of losing their support, it they are treated fairly.

The suggestion previously mentioned was that the revenue from membership should be used for the payment of the expenses of our essayists and clinicians outside the society. It frequently is quite easy to read a paper from notes, or from manuscript, but it is sometimes a difficult and expensive undertaking to give a clinic; and the question arises, Which is the most valuable to the association? If the clinic is devoid of financial interest to the clinician, there can be no reason why he should not be entitled to the same remuneration as an essayist receives, because the clinic is frequently of greater value. The revenue from membership fees should be used for this purpose, but the revenue from the exhibitors should be used exclusively to pay for the hall and other necessary expenses incidental to supplying their needs. When this plan was proposed to the exhibitors, everyone of them approved of it. Many felt that in previous years they had paid the entire expenses of the meeting, which did not seem just. While Dr. Cary's suggestion is a very good one, I believe we need never have any fear of not having enough money from both membership fees and the exhibitors to enable us to obtain the best essayists and clinicians for our meetings.

Dr. R. O. Schlosser, Hartford, Conn. I think these matters should be more thoroughly discussed in our meetings. I consider that a sinking fund is a fine thing. Whether we are going to be without exhibitors or not depends on several things. In our state meetings, as well as the larger meetings, we have those who believe in having the exhibitors and those who do not, and I am sure that if we canvassed our membership we should find some on both sides—for, to a great many, exhibits are as interesting as the papers and clinics. I do not think the time will ever come when we could afford to do without exhibits, nor do I believe that we shall ever reach a point where exhibitors would voluntarily cease to come to our meetings, even with the increasing number of purely manufacturers' meetings that are being held from time to time. Before we take any action on the president's suggestion we should know more of the details; for instance, how long this sinking fund is to go on accumulating before we may make use of it. Of course, the benefit of it can be of significance only if the sinking fund is made large enough. I consider two hundred dollars a very moderate sum to start with. I should be in favor of increasing it to five hundred. We should try to make a contribution to it annually until we get, say, five thousand dollars, then we could use the fund for getting clinicians and essayists of a character to stimulate interest in our meetings, and bring more members to them.

Then the question arises, Is a mere matter of money going to give us better clinicians and essayists? Those who have served us in days gone by and are giving us the most now are not those whom we could pay adequately for their services.

The matter of the place of holding the meeting must also be considered. If we did not have exhibits, we should not need such a large place. I hope others will have something more to say on this subject.

Dr. E. S. Rosenbluth, Bridgeport, Conn. The suggestion of our president, Dr. Cary, is very good and timely. The plan to establish a fund in order to produce an income to apply to any deficit that may arise is excellent. My experience in the past has been that the matter of raising sufficient funds for a dental society is largely a matter of management. One administration, after trying its best, will find when figuring up accounts that there is nothing left in the treasury, while the succeeding officers, by superior executive ability, will succeed in doing better and leave a substantial amount in the treasury—which during the following year is often dissipated.

I would suggest that there be a fund built up by putting aside such an amount as may be convenient, whenever there is a surplus, and adding to it as substantially as possible during each ensuing year, until the sum of one thousand dollars is obtained; and providing that no draft be made on this fund until the amount of one thousand dollars is exceeded. In this way we should be assured of at least a small income, and it might be increased to a substantial sum of, say, seven or eight thousand dollars later, from which an income might be derived which would be of considerable use to the society.

Dr. Cary (closing the discussion.) I fully realized in presenting this subject to you that there might be many who would receive it rather half-heartedly. We can expect to benefit from such a plan only by starting in a small way, and growing as we can. I do not think that any individual would think much of himself as a business man if he did not lay aside a little each year. He would think himself a failure. A society is not ordinarily expected to do that sort of thing, but in my opinion it would be a desirable object to work for, and we should have a comfortable feeling after we had acquired a substantial fund. If we had five thousand dollars, we should have an income, at five per cent., of two hundred and fifty dollars a year. As long as we can carry on the work of the society in comfort with our exhibits and annual dues, the two hundred and fifty dollars might be applied in many ways, such as in sending a remembering telegram or flowers here and there to an unfortunate member; or possibly the income might go toward the scholarship that we have been talking of this morning. In many ways we could use that little extra income; with it we could do things that we are not able to do today.

Dr. J. H. Jackson, Burlington, Vt. I wish to offer a motion to the effect that a committee of three be appointed by the chair to consider the suggestions made in the Address of the President and report at another meeting.

The motion was carried.

The President next appointed as the Committee on the Proposed Scholarship Drs. A. A. Hunt, Hartford; Charles McManus, Hartford, and Alfred C. Fones, Bridgeport.

The next item on the program was the reading of a paper by Dr. M. H. CAZIER of New York City, entitled "Regional Debility in Riggs' Disease."

[This paper is printed in full at page 619 of the present issue of the COSMOS.]

DISCUSSION.

Dr. C. Frank Bliven, Worcester, Mass. I believe the work of Dr. Cazier should be regarded as an epoch in the treatment of pyorrhea. It is fortunate that some men are sufficiently interested in the welfare of humanity to undertake such work, and this hall should be filled with men interested in the subject of the masterly paper we have just heard. The fact that a medical man has taken up this subject from the medical man's point of view and has made a scientific study of it is most interesting. I have read extensively on the subject during the nearly fifty years of my practice, and have practiced prophylaxis, or the removal of calcareous deposits, treatment of the tissues, and cleaning the surfaces of the teeth, and it would seem that during all these years I must have acquired some knowledge regarding it. We have many dentists who are devoting their time and attention to this disease, with different views regarding its treatment, but the men who can and do produce an absolute cure are few. I do not believe any of them are ready to state that they have ever absolutely cured a case of pyorrhea where there were so-called dry pockets. They are not really dry pockets, but are termed so.

Dr. Cazier states in his paper that it is his belief that he has a cure. Belief is not what we want. We want facts. Facts tell the true story of the value of any treatment and its results; so we must seek to know the absolute facts in regard to any treatment in order to establish ourselves as men with the ability to cure, and not merely to relieve.

Dr. Cazier claims that the primary cause of pyorrhea is the breaking down of the alveolar process, and if he is correct, it should be more strongly forced upon our attention, and its truth verified.

The question has arisen among different authorities as to whether pyorrhea is systemic or local. Some of our leading men declare it is a local disease and comes from improperly fitting crowns, which impinge on the gum tissue, calcareous deposits, overhanging margins of fillings, and malocclusion. If these were the real causes of pyorrhea, few would escape it. You have all seen many mouths with these conditions present, and yet with absolutely no pyorrhea present. If the cause is local, how does it happen that this condition exists? Personally, I have always believed the cause of pyorrhea to be systemic, and am still of that opinion.

Dr. Black made a series of scientific investigations, covering a period of four years, and if the microscope and lantern slides can be relied upon, he proved that calcareous deposits take place in the salivary plaques. If salivary plaques are not the result of systemic conditions I would like to ask those who believe the condition to be local to explain their formation. Dr. Hartzell is a strong exponent of the local origin; Dr. Medalia and the emetin exponents are supporters of the systemic theory, yet Dr. Medalia acknowledges that his treatment gives only temporary relief, although lasting long enough for the patient to establish a stronger physical condition.

Something else must be done besides dosing with pills and making local injections to procure favorable results. It is apparent that the parts must be well supplied with nutrition. As Dr. Cazier says, nutrition must be above par to produce a cure—I mean a permanent cure—so that the patient will not return in a few months suffering with the previous condition. To effect a cure the disease must be treated according to its cause. Inflammation is nature's effort to repair. If the fluids of the body are above par, they will resist disease, but as soon as they deteriorate the parts break down by what Dr. Atkinson called retrograde metamorphosis, and we have as a result pyorrhea. So long as the alimentary canal from the mouth onward is filled with effete matter that is not carried off, naturally we cannot expect sufficient rich blood to furnish or maintain life when needed, any more than we could expect a plumbing system to carry off waste material if a ball had been stuffed into the waste-pipe.

Dr. Cazier has given us a valuable paper, and those who have heard it and adopt its teachings will, I am confident, be rewarded with a full measure of success. As a personal indorsement of his method I wish to present my own case. There were four pyorrhea pockets in my mouth which were treated by Dr. Stanley. If the cause had been local it seems to me that after he had finished treating the pockets they ought to have healed, but they continued to discharge pus and remained as sore as the usual pyorrhea pocket. About two months afterward I took up the Cazier treatment, or perhaps Dr. Cazier would prefer to have it called the "rational" treatment. The pockets healed after being treated two months by my office girl. No further discharge of pus occurred, and the gums attached themselves to the teeth. If Dr. Stanley's operation had not been thoroughly done it does not seem possible that a cure could have taken place. I went on my vacation after this, and no treatment was given my mouth for a month. On my return the teeth were examined, and I was assured that my mouth looked better than it did when I went away. One or two treatments were given then because it was convenient, but for the past six weeks there has been nothing done. I shall be glad to give anyone the privilege of making an examination of my mouth tomorrow. I relate this history as testimony of my belief that Dr. Cazier has discovered a cure for pyorrhea.

Dr. Ned A. Stanley, New Bedford, Mass. Anyone who is interested in the treatment of pyorrhea must be interested in the essayist's paper. For many years I have been trying to effect a cure of pyorrhea. My means of treatment has been surgical—the curetting of the pocket. The men who are doing the best work today in pyorrhea are doing it by this means. It will not do for a man to make too radical a statement about anything today, because he may have to change his views tomorrow. I have obtained good results from the treatment that I have followed, but we cannot save all cases, any more than physicians can save all patients—some will die; and we are sure to lose teeth.

The essayist goes at the problem somewhat from the standpoint of a physician, and I want to give him credit for everything he has done. He has given us something that everyone interested in this subject ought to test. For one, I am going to give it a trial. The theory of supplying the parts with new blood is correct, but those of us who have been working in this field for years have noted things that a medical man cannot have observed, because he is not working technically along that line. All cases of pyorrhea are not due to malnutrition or withering of the parts. There is inflammation that produces this condition, and there are causes that I am inclined to think may be more of a systemic character. You often find a patient with the resistance of an ox, yet suffering with pyorrhea due to inflammation produced by an irritant. There are many causes that produce lesions which lead to the formation of pus pockets. Dr. J. D. Patterson made the facetious remark many years ago that anything from a piece of string to whiskey will cause pyorrhea. He was right. An ill-fitting cap becomes a local irritant. Sometimes the tissues tolerate it for a long time, but the irritant finally produces an inflammation which continues until finally the germs that are always present in the mouth meet a lessened resistance, and they begin their work when the opportunity occurs. So far as is known there is no specific germ responsible for this affection of the mouth. There are several organisms that are usually present. After the inflammatory process is established, the inflammation goes on independently of the original lesion. The overhanging edge of a filling may have been the original cause, or it may be food detritus that has become impacted between the teeth. Such particles, if not removed, will gradually cause the septum to disappear, a pocket is formed, and pus is apt to be present.

It is maintained by some that a cure must constitute a complete restoration of the parts. This, owing to the nature of the problem, is quite out of the question. When the transverse fibers constituting the peridental membrane are once destroyed they are gone forever. This tissue does not reproduce itself. More frequently the process is destroyed at the same time. There is, in some instances, a reattachment to the root surface of fibrous cicatricial tissue, which gives health and stability to the affected members and is gratifying to see.

Dr. Cazier has spoken of solvents being used. I have tried them, and in one instance the particular brand of "scorpion juice" used dropped on the patient's tongue, and pretty nearly burned a hole through it. I then made up my mind not to use solvents to soften serumal deposits, and have not found it necessary. The essayist did say that they should be removed, which is of course true, but after the best of surgery has been done you will still find some stubborn cases. I worked for two years on one case before I got it in as good condition as possible. Finally I asked the patient if he smoked very much. He replied, "Only thirty a day." That is one reason, I think, why recovery was so slow, but we ultimately got splendid results, and today the patient's mouth is in excellent condition.

I hope that the new treatment which Dr. Cazier has shown us will work out in practice. It certainly looks reasonable.

Dr. Cazier (closing the discussion). I trust that I shall not tire the few who have been courageous enough to remain, but I desire that at least a few may get the correct mental picture of this disease, that you may reach correct conclusions as to treatment, and that you may base these conclusions on facts which we have already established. This requires us to imagine for a few minutes that we are in a pus pocket and looking around; just imagine this, if you please.

We see, on one side of the castle in which we are residing, a quantity of limestone, rather irregular in its formation, and hanging against the wall. Near the edge is an irregular margin broken and ragged, where destruction has ended, and where vitality yet exists —where dead and live tissue are intermingled.

Now let us look at the side where the limestone is hanging. We see on the edge of this the so-called serumal deposit; that it impinges on vital membrane, but that where the deposit is heaviest the membrane is dead. A study of the morbid anatomy shows us dead and vital tissue intermingled; this is true of the pericemental membrane and the alveoli as well.

In practice we should be guided by the principles of surgery; not until a line of demarcation is formed do we operate. The result is fairly set forth in a report sent me by a prominent dentist in Philadelphia, who says, "I have a good many failures, first among those whose condition was hopeless when treatment was begun, and second among those who will not follow instructions; all the others get well." In practice we should seek to save all vital tissue, and sacrifice only the dead; even where vitality is feeble it may be restored.

Dr. Stanley spoke of the use of solvents, and said that his experience was disappointing. I prefer to think of the acidulous agent as a stimulant rather than a solvent, the idea being to cause tissue to swell and push off the deposit. You will not get the results from this treatment unless you build up the vital energy. It is like trying to make soup by boiling water and omitting the stock. In applying any irritant to tissue, whether it be a curet, an escharotic, or whatever it may be, the result depends on the state of vitality of the tissue that you are treating; if it is below par in resistance, death of the part follows; if the tissue is up to normal we have reaction that tends to repair by means of the inflammatory processes, but you cannot make devitalized tissues inflame, and unless it inflames it will not repair. If there is anything that is essential it is to clear up the meaning of our terminology. What do we mean by inflammation? If a tissue is subvital, inflammation in that tissue will be *nil*. Take, for instance, a laceration of the hand. You know what follows; pain, then swelling and heat. That is the reaction in vital tissue, but we do not have this in subvital tissue. In a dropsical foot, for instance, we have swelling, but no pain or heat. There is no inflammation; just the opposite. One is plus and the other is minus. If we have the minus sign before our cases we cannot convert it into plus until we have brought them up to normal, and have then gone a little beyond.

It has been asserted in the literature for generations that the alveolar process is the tissue of the body in which nutrition fails first, and it is certainly about time, after a score or more of years, that the truth of this contention should be acknowledged or that someone should show it to be false.

If we study another part of the body, the wrist for instance, and find a metacarpal bone necrosed, we should not wonder at an open sinus, but should recognize it as a symptom of what is going on below the surface; and so in the mouth, the distribution of the nutritive material through the arterial system leads it into the very periphery of the bony structure, and when this distribution fails, degeneration takes place. This makes us realize that in the mouth, in order to reach what the dental profession calls a cure, and what medical men speak of as recovery, we must reach the fundamental cause, and feed and revitalize the bony structure.

To sum up, I want to be understood to say that this is not a condition of malnutrition of the system. When that comes we have an added factor of seriousness. Syphilis, diabetes, or tuberculosis are added constitutional conditions, which will of course reduce the vitality, and will prevent or delay recovery. But aside from that, take the athlete, a man of forty or fifty years who is apparently well. I have seen scores of such persons in my office and the offices of others suffering from pyorrhea. We should realize that in otherwise normal, healthy persons the alveolar process undergoes senile dissolution before any other structure. Therefore we have regional debility, just as the literature refers to regional anesthesia. In senile dissolution pain is not a symptom; the tissues are affected by a process unproductive of pain. The soft parts swell like the dropsical foot, and the bone just crumbles away under irritation which would in vital parts cause pain, and demand relief. When they are below par the tissues melt away; instead of reacting they disappear. This is seen in the case of bedsore, in which there is lowered vitality due to exhaustion of the system; the circulation is feeble, and the heart action weak. The patient is recumbent, and the weight of his body is sufficient to suspend circulation in spots. A solution of continuity is the result. What do we do under such circumstances? First, remove the hindrance to the circulation, and adopt such measures as are indicated, cleansing, etc.

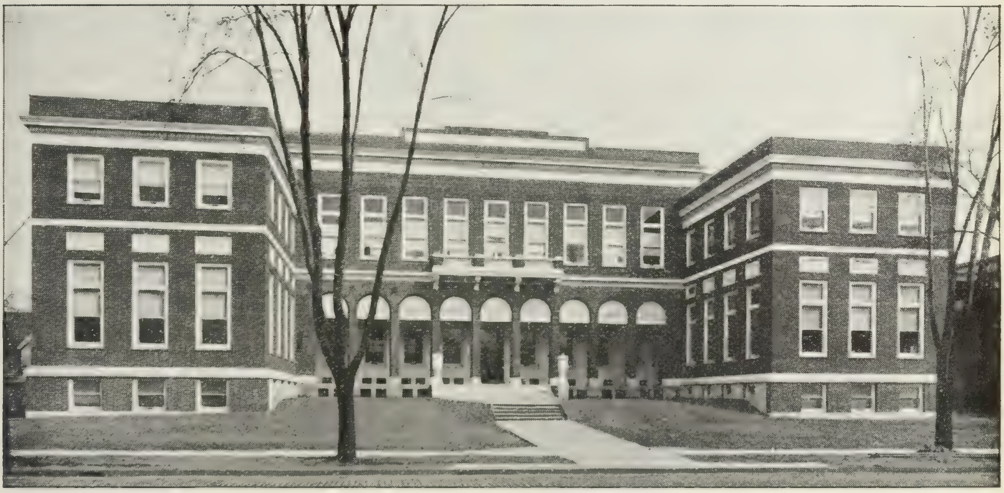
What I hope to see is the members of the dental and medical professions joining hands in team work in this, the most damaging disease from which mankind has ever suffered.

The meeting then adjourned until the Wednesday evening session.

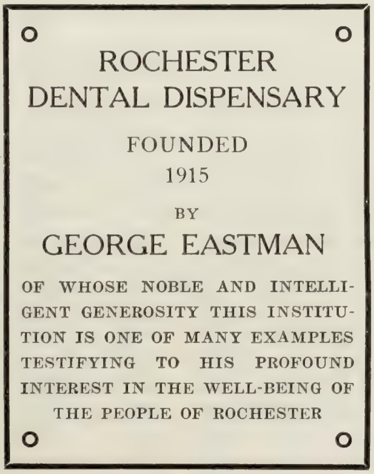
(To be continued.)

Dedication of the Rochester Dental Dispensary.

Afternoon of Wednesday, May 9, 1917.



THE dedication of the Rochester Dental Dispensary—the gift to the City of Rochester of Mr. George Eastman—on May 9th, marked the realization of a long-cherished hope of the dental profession of Rochester. On the afternoon of that day, in the presence of a magnificent audience composed of members of the dental profession from all sections of the country, city officials, and many representative citizens of Rochester who have been active in this public benefaction, the dispensary became one of the permanent institutions of the community, and stands as a lasting monument to its generous donor.



ROCHESTER
DENTAL DISPENSARY
FOUNDED
1915
BY
GEORGE EASTMAN
OF WHOSE NOBLE AND INTELLIGENT GENEROSITY THIS INSTITUTION IS ONE OF MANY EXAMPLES TESTIFYING TO HIS PROFOUND INTEREST IN THE WELL-BEING OF THE PEOPLE OF ROCHESTER

Tablet at entrance.

The Rt. Rev. THOMAS F. HICKEY, D.D., Bishop of Rochester, opened the dedication ceremonies with prayer; and immediately following,

Dr. HARVEY J. BURKHART, director of the activities of the new institution, addressed the assemblage, outlining the history of the movement which culminated in this great institution, and setting forth some of the objects and purposes in the minds of those who will conduct it. Dr. Burkhart spoke in part as follows:

We have come together today for the purpose of dedicating this magnificent building, not only to the children of Rochester, but to children everywhere—because we believe that here, and in kindred institutions, methods and practices will be developed which will go far toward the relief of human suffering and justify the existence of these institutions.

It is a proud day for this city, and for the dental profession throughout the country. This day marks another step in advance, not only for dental science, but for the great and permanent good which will come to humanity. This enterprise is being launched under happy auspices and with favoring breezes. The attendance here today of so many, from nearly every activity in the life of this great city, speaks volumes, and demonstrates in no uncertain manner the interest and enthusiasm of the citizens of Rochester in this new undertaking for the benefit of her children. We have here this afternoon representatives of the finest type of the city's manhood and the flower of her womanhood.

We are especially complimented by having with us distinguished members of the medical and dental professions, who have come from every section of the country to demonstrate their interest in and approval of the work which is being so happily inaugurated here today.

This city is to be congratulated upon having a municipal administration that has recognized the need for and the value of dental service for children, by making a substantial appropriation to carry on the work; that it has fourteen public-spirited citizens, members of the board of directors of the Rochester Dental Dispensary, who contribute one thousand dollars a year each for six years toward the running expenses of the institution, and the founder, who has erected this building and provided so generously for its maintenance. I desire also to mention the furnishing of the units in this infirmary by the daughters of the late Frank Ritter, Mrs. Shumway and Mrs. Brown; the providing of the equipment for the research laboratory by Mrs. Hofheinz, in memory of that fine, cultured, splendid professional man, loved and revered by all who knew him, Rudolph H. Hofheinz; and last, but by no means least, the decorating and furnishing of the beautiful children's room on the lower floor by that friend of everybody, William Bausch.

It is a matter for sincere regret that this building and equipment have been delayed. The architects and contractors have labored against great odds, and if it had not been for the distressing and awful world conditions, this dispensary would long ago have been completed and in working order. The equipment will soon be installed, when it is hoped you will come often to give your sympathy and encouragement to this project.

It is my pleasure to publicly acknowledge the greetings and congratulations for this occasion from Thomas A. Forsyth and the directors of the Forsyth Dental Infirmary for children in Boston, the pioneer institution of its kind in the world, and one that has been and is doing and will continue to do a splendid and wonderful work.

TRIBUTE TO MR. EASTMAN.

I am sure I voice your sentiments when I speak of the regret which we all feel because of the absence from these festivities of the founder of the Rochester Dental Dispensary. He is not present by reason of the genuine modesty and wholesome simplicity of the man, who shrinks from public applause and praise, and finds his greatest pleasure and a full acknowledgment of his benefactions in the evidences of the real worth of the work accomplished in the various institutions to the support of which he has so liberally contributed.

This beautiful building, with its plain, simple, splendid architecture, illustrates in a striking manner the character of its founder. In this man are found those fine traits of character and splendid ideals that make us proud to be associated with him in this work. There could be no finer tribute to his worth as a man and a citizen than the compliment which is paid him by this gathering of the representative citizens of Rochester and vicinity and of representatives of the dental profession from all parts of our land.

His generosity in contributing to

worthy objects is well known, but by far the most striking characteristic of the man is his broad and profound human sympathy. This genius and big business man has not been so absorbed in his own affairs and in the gigantic enterprises with which he is connected that he has lost sight of the men, women, and children who are in distress and require the services of this and other institutions to fit them to play their part in life's game. It was with a keen appreciation of the benefits which would come from the establishment of an institution like this, for the treatment of children's teeth, that prompted him to make his generous contribution.

His love for and his interest in children is well known, and to do something for the alleviation of the sufferings of childhood, to make it more sweet and lovely, and to give every child in the city a fair and equal start in life's race, were the controlling reasons that animated this modest and unassuming gentleman to found this beautiful and splendid institution.

All honor to him! and may joyous, happy children sing his praises from the fulness of their hearts, in appreciation of the blessings which have come to them by the founding of this dispensary by Rochester's foremost citizen, George Eastman!

Following Dr. Burkhart, Hon. HIRAM H. EDGERTON, mayor of Rochester, addressed the audience on behalf of the city of Rochester.

The presentation of the building was made by Dr. RUSH RHEES, president of the University of Rochester, followed by Mr. EDMUND LYON, vice-president of the Rochester Dental Dispensary, who accepted the building on behalf of the directors.

Addresses were also made by Mr. F. Harper Sibley, president of the Chamber of Commerce; Dr. Augustus S. Downing, Commissioner for Higher Education of the State Department of Education of New York State; Dr. Truman W. Brophy, Chicago, president of the International Dental Federation; Dr. L. L. Barber, president of the National Dental Association; Dr. Robert Murray, president of the New York State Dental Society; and Dr. Wm. W. Smith, representing the Rochester Dental Society.

The ceremonies were closed with a benediction pronounced by Rev. Dr. WM. R. TAYLOR, pastor of Brick Presbyterian Church, after which the guests were invited to make a tour of inspection prior to partaking of a luncheon served in the building.

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.
Devoted to the Interests of the Profession.

EDITED BY
EDWARD C. KIRK, D.D.S., Sc.D., LL.D.

PUBLISHED BY
THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Virgin Islands, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, JUNE 1917.

EDITORIAL DEPARTMENT

Our Golden Opportunity.

FOR a full half century before dentistry was established as a legitimate factor of the government service, in 1901, by the act of Congress providing for dental service in the army and navy on a contract basis, the dental profession had made almost continuous effort to secure the opportunity to demonstrate the indispensable character of the service which it was capable of rendering to those engaged in the defensive work of the nation. The measure of the importance of dental service in the army and navy as estimated from the point of view of the administration was practically evidenced by the fact that the dental service provided for in the beginning was upon a strictly contract basis—which meant neither more nor less than that the government hired a certain number of dentists to look after the teeth of enlisted men, in the same way that it would hire any other service presumably not entitled to military rank.

While the opening thus made for dentistry in the government service was neither dignified nor commensurate with its professional position, nor in accordance with the character of service which dentistry was capable of rendering, this journal advocated the acceptance of the terms which the opportunity at that time afforded, on the ground that it would enable dentistry to practically demonstrate in due course that its service was something larger and more important than was at that time recognized by the government, and that if the dental profession fairly and fully utilized the limited opportunity presented, the essential usefulness and larger possibilities of its service would in time be appreciated at their intrinsic value and be duly recognized.

Later the objectionable contract feature was eliminated, and dental surgeons were accorded a certain rank and dignity more in accordance with their professional standing. The evolution of dentistry since 1901 has completely reorganized, re-created as it were, dental ideals and re-oriented the point of view and estimate of the dental field of activity, both within and without the dental profession.

At the time of the civil war the only standard of dental qualification for admission to the army service was that the recruit should have a sufficient number of teeth to enable him to masticate his food, and first of all to enable him to bite off the paper cap of the cartridge which constituted his antiquated type of ammunition. The soldier who could not ''bite the cartridge'' was deficient as a shooting machine. With the introduction of improved arms and ammunition the old paper cartridge became obsolete, but the government ideal of teeth ''suitable for purposes of mastication'' is still maintained, possibly among other reasons because of the persistence of the administrative conception of the usefulness of teeth for biting purposes in general and the biting of paper cartridges in particular. It is true that some larger conception of dental efficiency is manifested in the present government requirement that mouths of recruits shall be free from suppurative conditions; hence we may assume that recognition of the important relation which mouth hygiene bears to the health of the soldier is to some degree taken into account, and the more modern governmental conception of the value and sphere of usefulness of the dental surgeon is becoming increasingly evident as the importance of the health relationships of the particular territory of the dentist becomes more generally known in military and administrative circles.

We are now very closely approaching the point where we should be able to secure government recognition of the indisputable fact that the dentist within his sphere of activity is a conserver and guardian of health; that the pathological conditions of the mouth and its contained tissues and organs with which the dentist is required to deal cannot be overlooked or neglected in the selection of recruits for the defensive arm of the nation. Dentistry has, since the time that it emerged from its swaddling-clothes as a profession, over-emphasized those of its activities that are included in its mechanical and prosthetic procedures. Even within its own professional ranks, until in comparatively recent years, it has been the custom to exalt manipulative skill as the slogan of its advance and as the exponent of its professional achievement. Today, dentistry has wakened up to the fact that the biological factors in the mouth which determine the processes of health and disease are, after all, its chief justification for existence, and that the properly trained and educated dentist is a healer, a guardian of health—a medical specialist in precisely the same sense that the exponent of any other department of the healing art is a medical specialist.

It is this view that must be given prominence and emphasized in any further efforts which may be made to improve the position of the dental practitioner in the medical service of the government. The present war emergency is the golden opportunity of dentistry. There is a present demand for a greatly enlarged enrolment of dental surgeons in the army and navy. It is of fundamental importance that those who have the best interests of the dental profession at heart see to it that only men properly equipped, those who have had the best training, and, above all, those who have correct ideals as to the meaning of our profession, should be admitted to the government service. They must become propagandists of the idea that dentistry is a specialized department of the healing art, and not a sublimated form of artizanship. Their work, their efficiency, their scientific intelligence, must be of such character as to readjust the administrative attitude of mind so that in due course they may obtain such rank and status as their position as professional men entitles them to receive.

Under the exigencies of the war situation the evolution of society proceeds with abnormal rapidity. Changes affecting our professional progress are speeded up under war conditions, so that the dentistry of tomorrow will in many of its aspects bear little resemblance to the dentistry of the past. A sifting-out process is in rapid progress whereby the best in dentistry is being brought to the surface, and that which is useless or obsolete is being cast aside. The economies necessitated by war conditions are making necessary the abandonment of many uncertain and practically useless methods, and are bringing about a concentration of effort upon those lines of activity which are of the most practical use.

Incidental to this evolutional process it has already become evident that a thorough standardization of the whole armamentarium of the dental profession is a fundamental necessity. At the earnest request of government officials a committee national in the scope of its work has now under active preparation plans for revising the whole dental armamentarium, with the object of placing it on a standard and uniform basis which will affect not only the process of manufacture, but must as a fundamental necessity unify the methods of teaching in our dental schools. All along the line are evidences of important changes looking toward higher efficiency and a larger scope of activity for the dental profession. If dentistry realizes its opportunity and its members will co-operate in a patriotic spirit in the work of standardization and unification, we shall be able efficiently to demonstrate the possibilities of our profession in the prevention and relief of human suffering. It must then inevitably follow that it will achieve a recognition, both by the government and by the public, otherwise unattainable.

Death of Dr. Frank Holland.

We regret to announce the death, on May 7th, of Dr. FRANK HOLLAND of Atlanta, Ga. A full obituary notice of this prominent dentist will be given in a subsequent issue of the DENTAL COSMOS.

BIBLIOGRAPHICAL

A WORK ON SPECIAL DENTAL PATHOLOGY, DEVOTED TO THE DISEASES AND TREATMENT OF THE INVESTING TISSUES OF THE TEETH AND DENTAL PULP, INCLUDING THE SEQUELÆ OF THE DEATH OF THE PULP, ALSO SYSTEMIC EFFECTS OF MOUTH INFECTIONS, ORAL PROPHYLAXIS, AND MOUTH HYGIENE. By G. V. BLACK, M.D., D.D.S., Sc.D., LL.D. Chicago: Medico-Dental Publishing Co. London: Claudius Ash, Sons & Co., 1915. With 518 illustrations, pp. xxviii, 476. Cloth, price $10.00.

The publication of a new volume bearing the authorship of Dr. G. V. Black is an event of considerable importance in the history of dental literature, and in this instance an event commingled with sorrow when it is remembered that the book is a posthumous work issued from the press some few months after the death of the author. With a long literary experience spread out behind him, with a full knowledge of the fruition of much of his labors, he was only permitted, like the prophet of old from Pisgah's height, to realize the partial completion of his latest toil. It may, however, be taken for granted that Dr. Black had much satisfaction during the last few years of his life, in being the creator of another book in the making.

What is the nature of the new volume lying before us? Does it increase or maintain or detract from the reputation of the author?

The astute reader must be the judge. Frankly we confess that we have felt some degree of disappointment as we have read and re-read many portions of the book—for the chief reason that frequently we fail to find that special dental pathology which its title leads one to expect. The use of the word "special" anticipates a completer and more thorough treatment of the subject than is actually the case. True, each part of the study shows very considerable technical and scientific knowledge, and is dealt with exhaustively in several instances. But, as will presently appear, the omissions of important pathological conditions associated with the investing tissues of the teeth and the dental pulp are numerous and to be deplored.

After a preface and introduction in which the histology and function of the tissues and alveolar processes of the jaws and saliva are considered, the work proper begins on page 62 with a consideration of the diseases of the tissues mentioned in the title, and their treatment. The work covers the following subjects: Studies of salivary calculus; gingivitis and pericementitis due to deposition of salivary calculus, and their treatment; gingivitis caused by injuries, and its treatment; chronic and suppurative pericementitis and its treatment—preventive, palliative, and radical; development of antiseptic and aseptic surgery and the use of antiseptics, also a study of acute and ulcerous gingivitis. Descriptions of the pathological conditions of the dental pulp, *i.e.* hyperemia, inflammation, and calcification, occupy less than thirty pages, while consideration of the treatment of these affections covers fifty pages. Acute and chronic alveolar abscesses receive considerable attention both with regard to mode of origin and surgical treatment.

Other subjects embraced in the work are consideration of necrosis of the maxillæ, chronic osteitis of the maxillæ, cyst formation, systemic effects of chronic oral infections, oral prophylaxis, mouth hygiene, and examination of the oral cavity. The book concludes with an appendix devoted to a description of methods of microscopical technique.

It will thus be seen that out of a book of 476 pages, 71 pages are devoted to histology, 76 to special pathology, and 122 to treatment.

In one of the early chapters of the book we learn of the frequent occurrence, in the so-called septal gingivæ, of small masses of epithelium that "have much the appearance of a lobulated gland." For this Dr. Black proposes the name "septal gland." We further read that, "If . . . . this is a gland at all, it is a ductless gland of very small dimensions. . . . . If ducts were there, they could easily be found." The microscopic appearances noted, we think, can be differently interpreted, and we are convinced that this is an error of observation on the part of the author, who himself speaks in vague terms of what is probably a hypothetical structure. To this structure he would ascribe an hormonic function, but even here he is uncertain, for he writes (page 22): "We do not know but that someone may yet discover that these ductless glands distributed in the septal gingivæ may also have some important function."

In addition to the omissions previously referred to, we find no mention of gangrene of the pulp, injuries to the pulp, its fibroid, atrophic, and fatty degenerations, tumors and degenerations of the peridental membrane, the various stomatites, dental ankylosis, hypertrophy of the gum, dilaceration, and odontomes, all of which we consider should certainly have been at least mentioned, if not discussed. Chronic inflammation of the pulp which is associated with the production of granulation tissue and hyperplasia is incorrectly described as hypertrophy of that organ. The description of the origin of cysts of the teeth given on page 394 cannot be taken as authoritative, as the author there quoted had not the status of a surgeon or pathologist. We consider the term "fused teeth," as employed by the author, unscientific; the condition is more correctly known as false gemination.

With regard to the treatment advocated throughout the various chapters of the book, the principles, generally speaking, are sound, trustworthy, and practical. The methods of treatment, however, are essentially those of Dr. Black, who seems reluctant, perhaps on account of the exigencies of space, to credit new aspects or forms of *modus operandi* to the many, and contented to confine them to the few. In spite of these criticisms, however, it may be said that this book performs a similar rôle with and has a similar mission to the works on operative dentistry which have emanated from the author's ready pen. In fact, it may be called an operative dentistry of the soft tissues of the teeth and immediate environment, and as such should appeal strongly to the general practitioner who seeks for information from this viewpoint.

The numerous illustrations, many of which are new, form a conspicuous feature of the volume, ranging as they do from seven colored plates of diagrams reproducing the appearances of alveolar abscess and the effects of injury to the gingivæ, rather irrelevant direct color photographs exhibiting the effects of various drugs on the skin, drawings of cases of gingivitis, and illustrations of the destruction of tissue caused by deposition of salivary calculus, to many half-tones which vary in their educational value and importance, and embrace such subjects as a cartoon of Rowlandson, photomicrographs, outline drawings of instruments and apparatus.

An interesting though brief chronology of the principal events in the development of antiseptic and aseptic surgery has been prepared by Dr. Carl E. Black.

In conclusion, it may be stated that this important though incomplete work will, by its suggestive teaching, prove of value to any intelligent practitioner—who, as already hinted, may regard it more as a text-book of operative dentistry and a continuation of similar works by the author on the same theme than an authoritative text-book on special dental pathology.

It goes without saying that the printers and publishers have done their work exceedingly well, and it is difficult, if not impossible, to criticize their typographical and pictorial results.

A. H.-S.

REVIEW OF CURRENT DENTAL LITERATURE

[*Journal of Medical Research*, March 1917.]

The Classification of Streptococci. By Francis G. Blake.

Blake here presents a very extensive critique upon this very complex and puzzling question. The classification of the streptococci is at present in a state of confusion. This confusion has largely been due to failure to recognize that a primary division of streptococci by the blood-agar plate method is essential, and to a wide variation in the methods, technique, and media used by various investigators. The ultimate goal to be attained is a classification founded upon an immunological basis, but such a classification is at present unavailable. A practical and simple method of classification for clinical purposes is desirable. The classification proposed by Blake is dependent upon a combination of the blood-agar and carbohydrate fermentation tests, lactose and mannite only being used for the latter. Attention should be paid to his standardization of the making of plates, and the preparation of his carbohydrate media.

By this method a classification of streptococci of distinct clinical value may be made and is as follows: (1) S. hemolysans, characterized on the plates by colonies surrounded by a wide zone of hemolysis; (2) S. viridans, characterized by the formation of methemoglobin or failure to alter blood, and distinguishable from the pneumococcus by being bile-insoluble. Further subdivision of the S. hemolysans by means of fermentation tests is of no practical value; S. viridans, however, is divided into three subgroups by its fermentation reactions in lactose and mannite, a procedure which is of value in that it gives some indication of the source of the strain in question. These subgroups are (*a*) S. buccalis, characterized by the fermentation of lactose and failure to ferment mannite; (*b*) S. fecalis, characterized by the fermentation of both lactose and mannite; and (*c*) S. equinus, characterized by the failure to ferment either lactose or mannite. Limitation of the carbohydrate-fermentation reactions to the use of lactose and mannite reduces the number of unclassified or variant strains to a negligible minimum.

It is believed that the adoption of the proposed method of classification will serve to obviate the confusion that has hitherto existed, and to provide an adequate means of identification of streptococci for clinical purposes until such time as an immunological basis for classification shall be developed.

[*Proceedings of the Royal Society of Medicine —Section of Odontology*, London, January 1917.]

Fuso-spirillary Peridental Gingivitis. By F. E. Taylor and W. H. McKinstry.

The subject matter of this report was afforded by a large number of cases, during the past few months, of sore throat among officers and men in the English army.

The ulcerative or pseudo-membranous inflammation associated with the spirillum and B. fusiformis of Vincent is not always confined to the pharynx, but also may be present on the mucosa of any part of the mouth and gums, constituting a fuso-spirillary stomatitis and gingivitis. In some of these cases the gingivitis is widely spread over the surface of the gums, but in others the ulcerative condition is confined more or less closely to that portion which is in close contact with the necks of the teeth, so as to constitute a real periodontal or marginal gingivitis. To this condition and its relationship to Vincent's angina of the pharynx, and to the character of the organisms found in the two conditions, the authors desire to call attention in this communication.

In advanced cases the gums are red, swollen, ulcerated in immediate contact with the necks of the teeth, often covered with a soft gray foul-smelling exudation. There is easy and profuse bleeding—at times limited to the necks of one or two teeth, in other cases extending the whole length of the upper and lower gums. The predilection is for lower first incisors and crowned and filled teeth. Cases may be acute or chronic. In uncomplicated cases the temperature remains normal, and the lymphatic glands are not enlarged or tender. It is probably an easily communicable condition, and diet does not seem to play any part. No relation to scorbutic affections of the gums seems likely, and lack of cleanliness is not the important causative factor.

The diagnosis is simple, both clinically and bacteriologically.

This disease should be sharply differentiated from pyorrhea alveolaris. The clinical history, the treatment, and the prognosis of the two conditions are totally different.

Treatment consists in scaling the teeth; the tartar and membranous deposit are removed from the gums with a glyco-thymoline spray, 30-40 lb. pressure per sq. in. The gums are then dried carefully and painted freely with a 0.2 per cent. alkaline solution of salvarsan or kharsivan as prepared for intravenous injection. The drying and painting of the gums are then repeated at least once, or, preferably, twice daily. Usually marked improvement is noticed in from twenty-four to forty-eight hours. In the majority of cases the disease yields entirely to treatment within fourteen days if daily applications have been thoroughly and systematically carried out. If improvement is delayed, the local medicament is varied. A mixture containing vinum ipecacuanhæ, liquor arsenicalis, and glycerin is apparently the most successful variation. Other good preparations include a 10 per cent. solution of quinin and colloidal preparations of iodin and silver—collosol iodum or collosol argentum. In all cases mouthwashes of H_2O_2 (hydrogen dioxid) or $KClO_3$ (potassium chlorate) and phenol were prescribed to be used freely after each meal. Patients were advised to destroy their toothbrushes, pipe mouthpieces, cigaret-holders, and all articles coming in contact with the mouth, and to obtain new ones, at the end of their course of treatment.

In the discussion, various forms of treatment were brought out:

(1) An iodin mouthwash, and then free

application of a mixture of equal parts of phenol and camphor. For home use, mouthwashes of phenol and alum or $KMnO_4$ (potassium permanganate).

(2) Free swabbing with H_2O_2, 10-vol. Complete painting with lin. iodi. Polishing with a buff and pumice-stone. Seeking for pockets and packing them with cotton moistened in a saturated solution of chinosol; the pockets behind third molars are packed with small plugs moistened in pure phenol. Scaling; repacking; brushing of the gums, using a little table salt.

(3) Thorough scaling and cleaning; frequent irrigation under pressure; applications of liq. arsenicalis with vini ipecac. and glycerin alternated with salvarsan, also iodin, frequent and proper use of a clean toothbrush and vibratory massage.

(4) Applications of tincture of iodin, methylene blue, or a mouthwash of $KClO_3$ and myrrh. In rare cases local application of salvarsan may be required.

A report practically identical (but much abbreviated) with that of Taylor and McKinstry is given by E. E. Johnson in the *British Dental Journal* for January 15, 1917. The mixture, alternative for salvarsan, is more exactly given, viz:

Vin. ipecac.,	½ oz.
Glyc.,	1 dram.
Liq. arsenic.,	ad 1 oz.

Also, four cases out of about 200 are detailed.

Among the frequent reports of this condition to be found in the war literature is also the following by F. Ramond in *Progrès Medical*, Paris, for December 20, 1916. According to Ramond, each ulceration is mechanically cleaned out, then treated with $AgNO_3$ (silver nitrate). The patient gargles first with 1 p. c. solution of cocain. In five minutes the ulceration can be cleaned out. Hemorrhage may be arrested by gargling with a solution of H_2O_2. The cavity of the ulcer is then dried with cotton and touched with a tampon moistened with a 1 : 50 solution of $AgNO_3$. The procedure is not painful, but must be repeated daily for two to three days. The technique is the same for ulcerative stomatitis, except that sometimes a hard brush is used instead of the blunt curet to clean out the ulceration.

Cases of "fuso-spirillary periodontal gingivitis" are not by any means unknown to general civilian practice. Still, the almost epidemic nature of this disease among the armies affords an incomparably richer material as a basis upon which to develop satisfactory treatment.

PERISCOPE

Removal of Teeth in Fractures.—Differences of opinion among dental surgeons prevail as to the question of septic teeth. Some limit the operation of extraction to the teeth immediately adjacent to the fracture; others freely extract all teeth to which the term "septic" can be applied. In civil practice we must often have seen fractures of the maxilla and mandible unite, within an average period of from six to eight weeks, where no teeth, either clean or septic, have been removed. In cases of delayed union we have commonly found a loose tooth or a root in the line of fracture to be the cause. Furthermore, we have probably noticed that the extraction of the tooth on either side of the line of fracture, in a crowded dental arch, diminished the risk of delayed union from loose teeth, and prevented the after-formation of a gum pocket. But war practice has modified one's attitude toward the extraction of teeth. Mr. J. F. Colyer has lately demonstrated to us certain cases of delayed union of fractures caused by septic teeth. Teeth apparently remote from the line of fracture were found to be directly in connection with it by means of fissures running through the bone. This condition was quite unsuspected, and could only be observed in a radiogram. In future, therefore, we must pay more attention to the position of septic teeth in relation to the fracture, and our chief assistance will be found in a clear and well-taken radiogram.—W. B. PATERSON, *Brit. Journ. of Dental Science.*

Something New in Plate Repair.—To replace a broken bicuspid, select a porcelain crown to fit the case, and with an engine bur fit a seat for the crown. Now, with a drill, make a hole running up into the rubber on the buccal position of the plate, bend the post to fit, and cement in place. Most plates are thick enough for this kind of repair of all teeth but the molars. Molars can be repaired by using the diatoric teeth, seating the same as above, and using small nickel-plated woodscrews, which can be bought at any hardware store, as posts.—G. B. Speer, *Dental Summary.*

To Flow Casting Wax to the Bottom of Deep Pits.—It is sometimes difficult to force wax perfectly into pits of sharp depressions. A simple way of doing this is to plunge a heated instrument like a canal plugger through the wax to the bottom of the pit. This carries the wax with it. As the instrument is withdrawn, if it leaves a hole, press a small piece of the casting wax into it with the finger or a flat burnisher. In this way a deep depression may be perfectly filled with wax. Even in a tooth in which the pulp is alive there is little discomfort, as the heat is quickly dissipated.—W. F. Lawrens, *Dental Review.*

A Handy Matrix for Large Filling Restorations.—One of the most satisfactory matrices for use in those cases in which it is necessary to embrace the whole tooth, especially where the cavity extends below the gingival margin to any extent, is the ordinary anchor clamp band used in orthodontic work. After removing the tube for carrying the bar the band can be quickly and easily adjusted to the tooth and screwed up. This is a much more satisfactory method than using the usual handmade matrix, and has the great advantage of the operator's being able to use the band again and again for this purpose.—W. S. Wilkinson, *Oral Health.*

Consolidation of Licensing Boards.—The Illinois Legislature is considering a law that will consolidate the various licensing boards under a single administrative office. Graduates of medical, dental, and pharmacal schools will be examined as before by their respective examining boards, but these boards are to be appointed and report to the officer or director of the department of registration and education. This plan may operate to economic advantage in the way of lessening the number of licensing bodies, and it should, if wisely conducted, become a more efficient method of standardizing qualifications for professional practice. Whether it is wise to place so important a function in the hands of a department having little or no personal relations to the various callings affected is a matter of some doubtful propriety. If the head of the department should be wise, honest, and efficient, he will take a personal interest in the business of his department, and there can be little doubt as to the wisdom of the scheme. We have for a long time contended that all licensing of persons having to do with the public health should be concentrated in an efficiently organized state health bureau. We believe in this way better health laws would be possible and stricter enforcement of law would result, to the great advantage of the people.—N. S. Hoff, *Dental Register.*

Nickel-copper Amalgam.—Nickel-copper amalgam, in the opinion of those who are acquainted with it, has all the virtues of copper amalgam without any of its disadvantages. I have used it with every satisfaction during the last three years or more, many of the fillings being constantly under observation. In my own case I have had a large approximo-occlusal nickel-copper amalgam filling in a second molar for a considerable time, and it stands the stress of mastication perfectly, comparing very favorably with a high-grade similar filling in the tooth adjoining. It keeps a good color and does not stain the denture, nor does it show any signs of cupping.—S. Lever, *Commonwealth Dental Review.*

Effects of Fatigue on the Teeth.—Just to illustrate the deleterious effects of fatigue on the teeth, I want to tell you what some of our research workers have been doing along that line. They have been analyzing the salivas of the pregnant women in the maternity hospital, and have found that as gestation progresses and fatigue consequently becomes greater, the calcium content of the saliva becomes lower, the occurrence of caries greater, and the resistance of the mouth becomes weaker. These results have been so constant that in the laboratory the experimenters have been able to tell from an analysis of the saliva how far pregnancy has advanced. When one considers the life of the average person today, under the stress of rushing progress and in a state of constant fatigue, can he wonder that his mouth fails to remain self-protecting, but needs prophylaxis to keep it healthy? Bacterial plaques cling to the teeth; and the saliva, which should be the protecting fluid of the mouth, no longer is able to neutralize its acidulation by these bacteria or fermentation caused by them.—H. C. Hartwig, *Internat. Journ. of Orthodontia.*

A Hint About Dental Bridges.—If a dental bridge is attached to a solid fixed anchorage at one end and has a loosened tooth or root for anchorage at the other, it will be a short-lived bridge. The fact that it is movable at one end makes a lever of such a bridge, and the force of mastication, being the power applied, will tear the solid fixed end loose from its anchorage, or loosen the root or break the bridge. A firm fixed anchorage at one end of a bridge will not sustain and hold firm the opposite end if the anchorage of said opposite end is loosened in the outset, or becomes loosened after the bridge has been in use. If the anchorage for one end of a bridge is not firm the anchorage for the opposite end should be correspondingly movable. If the anchorage for either end of a bridge is not firmly fixed it would be better to choose some other method for restoring or supplying the lost teeth.—H. A. Cross, *Dental Review.*

Crown or Bridge Facing.—A very good crown or bridge facing is made from the ordinary plate tooth. Select a rather thick tooth, cut off the pins, and flatten the back, also flatten the mesial and distal sides by grinding slightly. Then cut a groove running approximately from the middle of the mesial cervical line to the mesial contact point or a little anterior to it, also the middle of the distal cervical line to the distal contact point or just anterior to it. These grooves should be just deep enough to give sufficient strength to the backing, which is made by casting from a wax model made over the lingual side of the facing and into these grooves. The facing forms a simple dovetail in the backing, making a very strong combination. The incisal edge is free of metal, giving the translucent effect so much desired, and the metal extensions on the mesial and distal surfaces are hardly discernible, or at most have the appearance of small fillings.—Frederick W. Stephan, *Dental Review.*

Copper Amalgam.—Copper amalgam possesses, undoubtedly, therapeutic properties that other amalgams do not; further, copper amalgam does not "flow" under stress, neither does it shrink nor expand; these qualities, you will observe, make it a most valuable material. Unfortunately, copper amalgam does not give consistent results, even in the same mouth when two fillings have been inserted at one sitting. For this reason its use has largely been restricted. That it has preventive qualities is undoubted, and whenever these fillings have been inserted, even with moderate care, the teeth have usually been saved, though the fillings may have wasted. In experimenting I have found that copper amalgam, though setting exceedingly slowly, will form a complete union with almost any silver-tin alloy, even those which set rapidly; I therefore line with copper amalgam cavities in which I cannot secure absolute dryness, and finish the filling with one of the harder silver-tin alloys, pressing one amalgam while plastic into the other.—G. C. Nicholson, *Commonwealth Dental Review.*

The Roentgen Ray in the Diagnosis of Pyorrhea.—The limitations in the value of the roentgen findings in any disease should be mentioned. While the roentgen findings in pyorrhea as a rule agree very well with findings elicited by a digital or instrumental examination, and are obtained with far less discomfort to the patient, there are certain respects in which they are disappointing. Let me mention a few of these: Sometimes a pyorrheal tooth is quite loose, and a well-defined pocket is expected in the roentgenogram. Instead, it may require a stretch of the imagination to find in the roentgenogram more than a simple loss of the normal white line. This is undoubtedly because the atrophy which has occurred is diffuse and poorly demarcated. Again, the tooth shows no looseness on examination, and the roentgenogram shows the deepest kind of a pocket. This apparent discrepancy is undoubtedly due to the escape from the disease of a limited portion of the investing structures, not recognizable roentgenographically, but sufficient in amount to maintain the stability of the tooth for the time being. A very important point in the diagnosis may be entirely undemonstrable by roentgen methods—and I refer to the activity of the disease at the time of examination. Quite frequently roentgenograms are essentially similar in cases in which gross amounts of infective material can be expressed from the jaw to those in which the disease in all its clinical manifestations is entirely quiescent or advancing at a very slow rate. It may be sufficient to mention the general roentgenographic fact that in an ulcerative process in which bone shadows show partial or poorly limited decalcification, the process is in an active or rapidly progressive stage, whereas in well-demarcated cases in which areas of complete liquefaction lie directly adjacent to areas of undisturbed bone, the process may be considered more chronic in type.—H. E. Potter, *Dental Summary.*

OBITUARY

Dr. John W. Meng.

DIED, April 2, 1917, at his home in Lexington, Mo., in his seventieth year, after a protracted illness, JOHN W. MENG, D.D.S.

Dr. Meng was the son of the late Dr. S. T. Meng and Elmira Harrison Meng, born October 6, 1847, in Bloomfield, Callaway county, Mo., where he obtained his early education. At the age of sixteen he enlisted in the Confederate army, serving the last eight months of the war, being a member of Company B, Gordon's regiment, Shelby's brigade.

After the war Dr. Meng located in Lexington, Mo., and took up the study of dentistry with the late Dr. C. M. Stewart, and in 1870 was graduated from the Baltimore College of Dental Surgery. He continued in the active practice of his profession until about two years ago, at which time he retired on account of failing health.

Dr. Meng was a man of sterling character and strong convictions, and was held in high esteem by his friends and acquaintances. He was for years an active member of the Missouri State Dental Association, which at its recent meeting in St. Joseph adopted suitable memorial resolutions.

Dr. Meng attained a high degree of proficiency in his profession, especially as a "soft gold" worker. He was preceptor to a large number of students, the writer being among the fortunate ones, in each of whom he took a lively interest, being proud of their successes and sympathizing in their misfortunes. Each one of them now mourns the loss of a dear, true friend.

Dr. Meng was well known to the "big game" hunters of the Rockies, and for years made an annual trip to the West to spend a few weeks at his favorite sport. He delighted to relate to friends his experiences on his big hunting trips. In his home and office were many trophies bearing evidence of his prowess as a hunter of "big game."

Dr. Meng was married August 28, 1874, to Miss Anna P. Carter of this county, who with one son, W. D. Meng of Kansas City, and one daughter, Mrs. Charles H. Swift of Lexington, survives him. He also leaves one brother, Dr. E. R. Meng of St. Louis, and three sisters—Mrs. James F. Winn of Lexington, Mrs. Henry Reinhart, and Miss V. Lee Meng of Columbia, Mo.

Interment was made April 4, 1917, at Dover, Mo.

JAMES L. PEAK.

"In Memoriam" Resolutions.

Dr. Isador Lett.

THE American Academy of Dental Science recently passed the following resolution on the death of Dr. ISADOR LETT (an obituary notice of whom appeared in the issue of the DENTAL COSMOS for October 1916):

Whereas, our esteemed Fellow, Dr. Isador Lett, has been removed from us by Divine Providence, it is fitting that we should make a record of his death, and express our sorrow over the untimely close of his career; and

Whereas, by his genial disposition, and by his skill as a practitioner of dentistry, he has been a credit to the profession; therefore be it

RESOLVED, That we, the Fellows of the American Academy of Dental Science, feeling deeply the loss we have sustained, hereby express our appreciation of his friendship, and our sorrow at his death; and be it further

RESOLVED, That these resolutions be spread upon our minutes, and that a copy be sent to his widow and family.

CHARLES M. PROCTOR,
JEAN J. LOIZEAUX,
KNUT LUTTROPP,
Committee.

SPECIAL NOTICES.

Preparedness League of American Dentists.

Headquarters—3 Professional Building, 131 Allen St., Buffalo, N. Y.

IMPORTANT NOTICE.

At a joint meeting of the Ad Interim Committee of the National Dental Association and the Advisory Committee of the Preparedness League of American Dentists, held in Buffalo, April 26, 1917, a resolution was passed establishing an Advisory Committee composed of the present Officers, Advisory Board, Board of Trustees and the Ad Interim Committee of the National Dental Association. Action was taken confirming the permanent organization of the League as approved by the National Dental Association. It was also decided that the entrance fee to the League —$10.00—would continue in force.

ADVISORY COMMITTEE.

J. W. Beach	N. Y.	F. M. Casto	Ohio.	J. D. Millikin	Calif.
H. J. Burkhart	N. Y.	T. P. Hinman	Georgia.	A. W. Viney	Calif.
M. B. Eshleman	N. Y.	O. U. King	Indiana.	C. J. Lyon	Mich.
F. W. Low	N. Y.	T. W. Brophy	Illinois.	H. E. Friesell	Pa.
H. A. Pullen	N. Y.	W. H. G. Logan	Illinois.	E. C. Kirk	Pa.
H. L. Wheeler	N. Y.	G. N. West	Illinois.	J. V. Conzett	Iowa.
L. L. Barber	Ohio.	T. B. Hartzell	Minn.	B. H. Smith	Md.
S. D. Boak	Ohio.	T. W. Hergert	Wash.	F. T. Murlless	Conn.
H. C. Brown	Ohio.	F. O. Hetrick	Kansas.	M. F. Finley	D. C.

INFORMATION RELATING TO APPOINTMENTS IN

THE DENTAL RESERVE CORPS OF THE ARMY.

The National Defense Act of June 3, 1916, and the tentative regulations thereunder, provide for a dental section or branch of the Officers' Reserve Corps. The officers of the Dental Reserve Corps have the rank of first lieutenant, and are appointed and commissioned by the President, after having been found, upon examination prescribed by him, physically, mentally, and morally qualified to hold such commissions. Commissions are issued for periods of five years, at the end of which time the officers may be recommissioned, subject to such further examinations and qualifications as the President may prescribe. They are subject to call for duty in time of actual or threatened hostilities only. While on active duty under such call they are entitled to the pay and allowances (including quarters, fuel, and light) of their grade. They are entitled also to pension for disability incurred in the line of duty and while in active service. They are not entitled to pay or allowances except when in active service, nor to retirement or retired pay.

Appointees must be citizens of the United States, between twenty-one and fifty-five years of age, must be graduates of standard dental colleges, and must, at the time of appointment, be in the active practice of their profession in the states in which they reside.

The examination is physical and professional. It is conducted by boards consisting in each case of one medical and two dental officers of the Army, designated by the War Department.

The examination as to physical qualifications conforms to the standard required of recruits for the United States Army. Defects of vision resulting from errors of refraction which are not excessive, and which may be entirely corrected by glasses, do not disqualify unless they are due to or are accompanied by organic disease. Minor physical deficiencies may be waived.

The professional examination will be oral. If the applicant fails therein, he may, if he desires, have a written examination. An average of 75 per cent. is required to qualify in the examination. The examination comprises the following subjects:

(1) Dental pathology and bacteriology.
(2) Chemistry, physics, and metallurgy.
(3) Recent advances in dental surgery and technique.

Applications for appointment in the Dental Reserve Corps must be made in writing, upon the prescribed blank form, to the Surgeon-general of the Army, Washington, D. C., who will supply the blank upon request. The correctness of the statements made in the application must be sworn to by the applicant before a notary public or other official authorized by law to administer oaths. It must be accompanied by testimonials based upon personal acquaintance from at least two reputable persons, as to the applicant's citizenship, character, and habits, and by his personal history given in full upon the blank form furnished him for the purpose.

SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS *not later* than the 11th or 12th of the month preceding that of publication.

Coming Dental Society Meetings:

June and July.

JUNE.

American Medical Association. New York City. Five days: June 4th to 8th.

California State Dental Association. San Francisco. Four days: June 6th to 9th.

Connecticut State Dental Association. New London. Three days: June 28th to 30th.

Georgia State Dental Society. Brunswick. Three days: June 14th to 16th.

Nebraska State Dental Society. Omaha. Four days: June 4th to 7th.

North Carolina Dental Society. Durham. Three days: June 27th to 29th.

Northern Ohio Dental Association. Cleveland. Three days: June 7th to 9th.

Northwestern University Dental School—Alumni Association. Chicago. June 11th and 12th.

Oregon State Dental Association. Portland. Three days: June 14th to 16th.

Pennsylvania State Dental Society. Philadelphia. Three days: June 26th to 28th.

Postgraduate Dental Meeting. [Alabama, Mississippi, Texas, and Louisiana.] New Orleans. Four days: June 4th to 7th.

Tennessee State Dental Association. Memphis. Four days: June 19th to 22d.

Upper Peninsula Dental Society. Ironwood, Mich. Two days: June 29th and 30th.

Wyoming State Dental Association. Cheyenne. Two days: June 18th and 19th.

JULY.

New Jersey State Dental Society. Atlantic City. Three days: July 11th to 13th.

Examiners' Meetings.

Alabama Board of Examiners. Birmingham. June 18th.

Arkansas Board of Examiners. Little Rock. June 21st to 23d.

California Board of Examiners. San Francisco, June 8th; Los Angeles, June 22d.

Illinois Board of Examiners. Chicago, June 15th.

Indiana Board of Examiners. Indianapolis, June 18th to 23d.

Iowa Board of Examiners. Iowa City, June 9th.

Maine Board of Examiners. Augusta. July 12th to 14th.

Massachusetts Board of Examiners. Boston. June 22d to 30th.

Michigan Board of Examiners. Ann Arbor. June 18th to 23d.

Mississippi Board of Examiners. Jackson. June 19th.

Missouri Board of Examiners. Jefferson City. June 11th to 13th.

Montana Board of Examiners. Helena. July 9th to 13th.

Nebraska Board of Dental Secretaries. Lincoln. June 7th to 16th.

Nevada Board of Examiners. Reno. June 7th.

New Hampshire State Dental Board. Manchester. June 28th to 30th.

New Jersey Board of Registration. Trenton. June 25th to 28th.

New York Board of Examiners. New York City, Albany, and Buffalo. June 26th to 30th.

Oklahoma Board of Examiners. Oklahoma City. June 25th.

Pennsylvania Board of Examiners. Philadelphia and Pittsburgh. June 13th to 16th.

Rhode Island Board of Examiners. Providence. July 5th to 7th.

South Carolina Board of Examiners. Columbia. June 26th.

Tennessee Board of Examiners. Memphis. June 12th to 16th.

Texas Board of Examiners. Houston. June 18th.

Vermont Board of Examiners. Montpelier. June 25th to 27th.

Virginia Board of Examiners. Richmond. June 12th.

Wisconsin Board of Examiners. Milwaukee. June 20th.

Wyoming Board of Examiners. Cheyenne. June 26th to 28th.

Pennsylvania State Dental Society.

The forty-ninth annual meeting of the Pennsylvania State Dental Society will be held in Philadelphia, June 26, 27, and 28, 1917, at the Bellevue-Stratford Hotel.

J. F. Biddle, *Sec'y,*
Pittsburgh, Pa.

Wyoming State Dental Association.

The Wyoming State Dental Association will hold its second annual meeting in Cheyenne, June 18 and 19, 1917. All members holding National cards are cordially invited.

Peter Appel, Jr., *Sec'y,*
Cheyenne, Wyo.

Oregon State Dental Association.

The annual meeting of the Oregon State Dental Association will be held in Portland, June 14, 15, and 16, 1917. A cordial invitation is extended to members of other associations.

Jean Cline, *President,*
F. W. Hollister, *Sec'y.*

Nebraska State Dental Society.

The Nebraska State Dental Society will hold its fiftieth annual meeting, in celebration of its golden jubilee, in Omaha, June 4, 5, 6, and 7, 1917. All members of the National Association are cordially invited.

H. E. King, *Sec'y,* Omaha, Neb.

Connecticut State Dental Association.

Change of Dates.

Owing to war conditions it has been necessary to change the dates of the annual meeting of the Connecticut State Dental Association from June 14, 15, and 16, 1917, to June 28, 29, and 30, 1917, in Hotel Griswold, New London.

The committee has secured papers, clinics, and exhibits which you cannot afford to miss. Plan now to attend; have a good time; see and hear what others are doing.

Geo. S. B. Leonard, *Sec'y,*
Mystic, Conn.

American Medical Association

NEW YORK CITY, JUNE 4 TO 8, 1917.

(Clinical Congress — 4th and 5th.)

THE American Medical Association will hold its annual meeting in New York City, June 4 to 8, 1917. In all probability this will be the greatest meeting of medical men ever held in this country. The Committee on Arrangements consists of Drs. Wendell C. Phillips, Floyd M. Crandall, and Alexander Lambert. Headquarters at 17 West 43d st., New York City, to which all communications should be addressed. Monday and Tuesday, June 4th and 5th, will be devoted to a Clinical Congress. All departments of medicine will be represented, each department to have its own series of clinics, occurring in different parts of the city.

* * * * *

The great number of clinics, their scope and scientific value, will be unprecedented. The program is in active preparation, soon to appear in full in the *Journal* of the A. M. A.

Stomatology.

Between seven and ten thousand physicians are expected to attend this congress, and it is hoped that dental practitioners throughout the country will utilize this opportunity to become associate fellows of the Section on Stomatology, and thus be entitled to attend these clinics as well as the regular meeting of the association on June 6–8. The following is from a letter of the General Secretary:

> Dentists holding the degree of D.D.S. who are members of state or local dental societies and who are not eligible to regular membership, may be elected to associate fellowship by the House of Delegates of the American Medical Association when a formal application for such associate fellowship has been approved by the Section on Stomatology. In other words, when a dentist holding the required degree makes formal application for associate fellowship, accompanying this application with a certificate from the secretary of his state or local dental society, which certificate certifies to his being a member in good standing in that body, this application and the attached certificate is forwarded to the secretary of the Section on Stomatology for the approval of that section. The application is then in form for presentation to the House of Delegates for the election or rejection of the applicant.
>
> We shall be glad to transmit any such applications, or they may be sent direct to the secretary of the Section on Stomatology, Dr. EUGENE S. TALBOT, 31 N. State st., Chicago.

Program—Section on Stomatology.

WEDNESDAY, 9 A.M.

(1) Chairman's Address: "Radiographic and Microscopic Studies of the Tissues Involved in Chronic Mouth Infections." Dr. Arthur D. Black, Chicago, Ill.

(2) "Chronic Diseases of the Mouth of Interest to Both Physician and Dentist." Dr. Kurt H. Thoma, Boston, Mass.

(3) "Cysts of the Dental System." Dr. Kaethe W. Dewey, Chicago, Ill.

(4) "A Study of the Infectious Granular Tissue Found at the Apices of Pulpless Teeth Commonly Called Chronic or Blind Abscesses." Dr. Herbert A. Potts, Chicago, Ill.

(5) "The Relation of Devitalized Teeth to Focal Infection." Dr. M. L. Rhein, New York City.

WEDNESDAY, 2 P.M.

(6) "Epithelioma or Cancer of the Mouth." Dr. L. Duncan Bulkely, New York City.

(7) "Treatment of Cancer of the Mouth by Electric Cautery, With or Without Operative Measures." Dr. J. W. Bransfield, Philadelphia; Dr. G. M. Dorrance, Philadelphia.

Discussion—Dr. Albert Ochsner, Chicago, Ill.; Dr. Joseph Bloodgood, Baltimore, Md.

(8) "Injuries of Temporo-Maxillary Articulation, Their Diagnosis and Treatment." Dr. Henry S. Dunning, New York City.

(9) "Tuberculosis of the Tongue." Dr. John W. Means, Columbus, Ohio; Dr. Jonathan Forman, Columbus, Ohio.

THURSDAY, 9 A.M.

(10) "Bone Surgery as Applied to the Jaws, with Special Reference to Bone Regeneration." Dr. M. I. Schamberg, New York City.

(11) "A Composite Osteoplastic Closure of Clefts of the Hard Palate." Dr. John B. Roberts, Philadelphia.

(12) "The Use of Soup Bone for the Correction of Deformities or Defects of the Skull

and Face." Dr. Wayne W. Babcock, Philadelphia.

Discussion—Dr. Allen B. Kanavel, Chicago, Ill.; Dr. Frederick B. Moorehead, Chicago, Ill.; Dr. Geo. V. I. Brown, Milwaukee, Wis.; Dr. Thomas L. Gilmer, Chicago, Ill.

(13) "A New Operation for the Immediate Surgical Separation of the Superior Maxillary Bones to Widen the Nares for the Improvement of Respiratory and Other Conditions." Dr. Geo. V. I. Brown, Milwaukee, Wis.

Discussion—Dr. J. S. Evans, Madison, Wis.; Dr. G. L. Bellis, Wauwatosa, Wis.; Dr. O. H. Foerster, Milwaukee, Wis.; Dr. D. F. MacMillan, Chicago, Ill.

THURSDAY, 2 P.M.

(14) "War Experiences with Wounds of the Head, Face and Jaws." Dr. Joseph Eastman, Indianapolis.

Discussion—Dr. Henry H. Lyle, New York City; Dr. Geo. G. Davis, Chicago, Ill.; Dr. Kellogg Speed, Chicago, Ill.

(15) "A Preliminary Report of Investigations as to the Frequency of Metastatic Eye Infections from Primary Dental Foci." Dr. Joseph M. Levy, New York City.

All who are interested in the program are invited to be present and take part in the discussions.

ARTHUR D. BLACK, *Chairman*,
EUGENE S. TALBOT, *Sec'y*.

Headquarters of the Section on Stomatology will be at the Hotel Astor, Broadway and 45th st.

No more impressive opportunity for the fraternization of dental and medical men has ever been presented in the history of the profession. Every dentist who reads this announcement should enroll immediately in the Section on Stomatology (annual dues $5, which entitles him to the weekly *Journal* of the A. M. A.), and thus place himself in direct touch with the greatest happenings in medical science.

The Clinical Committee of the Section on Stomatology is as follows:

HENRY W. GILLETT,
ARTHUR L. SWIFT,
WM. D. TRACY,
HENRY S. DUNNING,
ARTHUR H. MERRITT,
WM. B. DUNNING, *Chairman*,
140 West 57th st., New York City.

Forsyth Dental Infirmary for Children.

PERMANENT STAFF APPOINTMENTS.

A competitive examination of graduates in dentistry (of less than three years' standing) for appointments to positions on the permanent staff for full- and half-time service will be held early in June at the Infirmary.

Appointments will be made for one or two years, as follows: Full-time service, requiring operating five and one-half days a week, at a salary of $1000 a year. Half-time service, requiring operating six half days a week, either forenoon or afternoon, at a salary of $400 a year.

These appointments will be made subject to satisfying the requirements of the Massachusetts State Board of Registration in Dentistry, and to qualifying in the practical work of the clinics during one month's trial.

Members of this staff will be entitled to the advantages of reports and clinics by experts in the various branches of dentistry from different parts of the world, in addition to the numerous regular clinics and lectures. Operators after serving three months are eligible, by qualifying, for appointments in the special clinics where postgraduate work is given. The operators on this staff have the advantage of the clinics and lectures of the Postgraduate School of Orthodontia.

The Infirmary clinics provide unusual advantages in the various departments of the institution where operative dentistry, orthodontia, nose and throat and oral surgery, extracting, novocain technique, radiography, pathological diagnosis, and research work are continually carried on. The average number of cases treated daily is more than 450 in all departments. All material and necessary operating instruments will be furnished. Up-to-date apparatus, including electric engines, sterile instrument trays, fountain cuspidors, compressed air, and the modern operating-room type of lavatories, are available for use.

A diploma of service will be issued by the trustees to each member of this staff who has completed his term of service in a satisfactory manner.

Applications for the above positions should be made at once.

Information and the date of the examination will be furnished by the director to those interested.

UNDERGRADUATE ASSISTANTS.

During the months of June, July, August, and September an opportunity is offered by the trustees of the Forsyth Dental Infirmary for Children to a limited number of senior undergraduate students to act as assistants in the clinics of the Infirmary. This privilege permits a student to obtain unusual clinical advantages in the various departments of the institution where operative dentistry, orthodontia, nose and throat and oral surgery, radiography, pathological diagnosis, and research work are continually carried on.

Operators' gowns and all instruments are furnished. Over 400 children are treated daily.

For further details apply immediately to the director.

DR. HAROLD DEW. CROSS,
140 The Fenway, Boston.

North Carolina Dental Society.

THE North Carolina Dental Society will hold its forty-third annual meeting at Durham, N. C., June 27, 28, and 29, 1917.

R. M. SQUIRES, *Sec'y*,
Wake Forest, N. C.

California State Dental Association.

THE California State Dental Association will hold its regular annual session for the year 1917 in San Francisco, Cal., June 6, 7, 8, and 9, 1917. A cordial invitation is extended to members of other associations.

For further information, and particulars regarding exhibit space, communicate with

JOHN E. GURLEY, *Sec'y*,
350 Post st., San Francisco, Cal.

Northern Ohio Dental Association.

THE sixtieth annual meeting of the Northern Ohio Dental Association will be held at Hotel Statler, Cleveland, Ohio, June 7, 8, and 9, 1917.

An attractive program is being arranged, and this promises to be one of the most interesting meetings held by the Northern Ohio Dental Association.

C. H. CLARK, *Sec'y*,
Youngstown, Ohio.

Tennessee State Dental Association.

THE "golden jubilee" of the Tennessee State Dental Association will be held in Memphis, June 19, 20, 21, and 22, 1917.

With many details definitely decided, others in process of arrangement, and a few important matters yet to be determined, the following is a synopsis of the program:

Dr. Arthur E. Smith, Chicago, Ill. "Nerve-blocking Anesthesia." Two or three lectures illustrated with slides and moving pictures. Table clinic with wet specimens, and a practical chair clinic. Assisted by Dr. J. J. Ogden of Memphis, Tenn.

Dr. Burton Lee Thorpe, St. Louis, Mo. "Practical Importance and Absolute Necessity of Mouth Hygiene." Dr. Thorpe approaches this all-important subject in an original way, and forever settles the question of obligation and service.

Dr. Charles H. Mayo, Rochester, Minn. "The Relation of Mouth Infection to Localized Systemic Disease." Dr. Mayo has been invited to give a public address on this important subject, and to permit his remarks to be discussed for a few minutes by a dentist and a physician. While Dr. Mayo has not been able to reply to our invitation, it is hoped he will accept, upon his return to Rochester.

Dr. Arthur D. Black, Chicago, Ill. "The Prevalence and Treatment of Peridental Disease." Dr. Black has not definitely accepted our invitation, but it is assured in the event that he is unavoidably prevented that the subject will be presented by a man of national reputation.

Dr. Henry W. Morgan, Nashville, Tenn. "Fifty Years of History." No one is more thoroughly capable of presenting the interesting history of our organization, which was founded by his father, than Dr. Morgan.

(To be secured.) "Treatment of Root-canals, Including Root-end Resection." This important subject will be presented by one of the best men making a specialty of this work.

Descriptive clinics — Moving pictures, "Wound Sterilization," by Dr. Alexis Carrel. "Plastic Surgery of the Face and Jaw," by Dr. Pont. "Original Method of Taking Impressions," by Dr. Edward H. Angle. "Application of Angle's New Ribbon Arch Appliance," by Dr. Edward H. Angle. "Apicoectomy," by Dr. A. Berger. "Periodontia Clinic," by Dr. Paul R. Stillman. "Root-canal Filling," by Dr. R. Ottolengui. "Dental Prophylaxis and the Dental Hygienist," by Dr Alfred C. Fones.

General clinics. (Fifty of the best clinics upon the most important subjects given by progressive and original men of the profession. A full list cannot be included in this synopsis.)

Entertainments. Tuesday evening, June 19th: Boat-ride, dancing and refreshments. Wednesday evening, June 20th: Public address and reception. Thursday evening: Jubilee banquet (all night).

Ladies will be entertained with luncheon, theater party, and reception, in addition to the boat-ride and banquet.

D. M. Cattell, *President,*
C. E. Hines, *Sec'y.*

Postgraduate Dental Meeting:

Alabama, Mississippi, Texas and Louisiana.

The states of Alabama, Mississippi, Texas, and Louisiana will hold a joint postgraduate meeting on June 4, 5, 6, and 7, 1917, in New Orleans, La. This will be immediately followed by a special detailed technical course, negotiations for which are being made with some of the most talented clinicians throughout the country. The time of the meeting, June 4th to June 7th, besides being a most agreeable season of the year, enables the committee to secure the services of experts in the work to be covered by the meeting, who would not be accessible at an earlier time in the year.

The subjects which will be covered during the meeting proper, by illustrated lectures, moving pictures, and clinics, and which will be given in their entirety, are—"Removable Bridge Work," with the most advanced lock and saddle construction. "New Methods of Replacing Lost Teeth Without Mutilation of Sound Members by a System of Saddles, Cast Inlay-fitting Clasps," etc. "Nerve Blocking," including the various phases of local anesthesia. "Radiography." "Root-canal Preparation and Filling." "Apicoectomy." "Treatment of Fractures of the Maxilla and Mandible." "Treatment of the Maxillary Sinus." "Prophylaxis, Periodontia, and Stomatology."

Experts placed in charge of the above subjects will each give special courses, starting immediately after the meeting, and lasting two or three days, or a little longer where the nature of the work requires it. Classes will be formed from among holders of membership cards to the meeting, which none but ethical dentists can obtain. These classes must necessarily be limited in size. Early application for membership and for special courses is urged, and the latter cannot be had without the former. Enrolment in order of registration. Apply to Dr. C. V. Vignes, chairman Committee on Credentials and Registrations, 709 Macheca Bldg., New Orleans.

The committees representing the four states will jointly fix membership fees.

The Committee on Publicity, Dr. J. P. Wahl, chairman, 1135 Maison Blanche Building, New Orleans, are preparing summaries of the work to be taught by each instructor at the meeting. Arrangements are being made relative to railroad and hotel rates, exhibits, entertainments, clinics, and floor arrangements.

Jules J. Sarrazin, *General Chairman,*
Leo C. Dempsey, *General Sec'y,*
Louisiana Committee.

Northwestern University Dental School.

Alumni Association Clinic.

The Northwestern University Dental School Alumni Association will hold the Annual Home-coming Clinic, 31 W. Lake st., Chicago, Ill., June 11 and 12, 1917. Good program for each day. All alumni are urged to attend this, which is expected to be the best meeting in the history of the organization.

M. M. Printz, *Sec'y,*
4235 Lake Park ave., Chicago.

Pennsylvania College of Dental Surgery.

Attention of Class of 1892.

The members of the class of 1892, Pennsylvania College of Dental Surgery, are requested to send their names and present location to the undersigned. The holding of the twenty-fifth anniversary of the class is the object in view.

J. E. Mitinger, *Sec'y,*
Greensburg, Pa.

NATIONAL DENTAL ASSOCIATION ANNOUNCEMENTS

Railroad Rates

To the Twenty-first Annual Meeting of the National Dental Association, New York City, October 22-26, 1917.

THE Trunk lines and the New England and Central passenger associations have granted a rate of two cents per mile in each direction, going and returning via the same route only, limited to midnight of October 30th.

Going tickets in Trunk line territory will be on sale October 19th, 20th, 21st, at the one-way fares, on the certificate plan, these certificates to be indorsed by general secretary, Otto U. King, and to be validated by the special agent of the railroads, who will be in attendance on October 24th, 25th, 26th. Return tickets to be sold on presentation of validated certificates, October 24th to 29th, at the difference between the fares paid on the going trip and the fares for the round trip. Return limited to continuous passage to destination, and not later than October 30th. This applies on tickets with a minimum of $1.00 for round trip.

New England passenger association tickets to be sold or certificates issued and good going October 19th, 20th, and 21st and returning not later than October 30th. Two cents per mile each direction, shore line mileage, going and returning via the same route only.

Central passenger association territory round trip tickets, requiring validation in New York City, will be sold on October 19th, 20th, and 21st, with a final return on October 30th. Two cents per mile in each direction.

There will be no fee for validation.

Committee on Transportation,
D. C. BACON, *Chairman.*

National Association of Dental Faculties.

THE 1917 meeting of the National Association of Dental Faculties will be held at the Astor Hotel, New York City, Friday and Saturday, October 19 and 20, 1917.

The Executive Committee will meet at 9 A.M., and the general session will open at 10 o'clock as usual.

CHAS. CHANNING ALLEN, *Sec'y,*
N. W. Cor. 10th and Troost, Kansas City, Mo.

American Society of Orthodontists.

THE annual meeting of the American Society of Orthodontists will be held at Excelsior Springs, Mo.—thirty minutes' ride from Kansas City—September 5, 6, 7, and 8, 1917.

The program will be one of the best ever presented by the society. All those interested in orthodontia are invited to attend.

F. M. CASTO, *Sec'y,*
Cleveland, Ohio.

Association of Military Dental Surgeons.

THE annual meeting of the Association of Military Dental Surgeons of the United States will be held at Hotel Astor, New York City, October 23 to 26, 1917.

J. D. MILLIKIN, *President,*
S. W. HUSSEY, *Sec'y.*

Upper Peninsula Dental Society.

THE next annual meeting of the Upper Peninsula Dental Society will be held at Ironwood, Mich., June 29 and 30, 1917.

R. E. MULLEN, *Sec'y-Treasurer,*
Ironwood, Mich.

Georgia State Dental Society.

THE forty-eighth annual meeting of the Georgia State Dental Society will be held at Brunswick, Ga., June 14, 15, and 16, 1917, beginning Thursday, June 14th. We extend a most cordial invitation to members of other associations to meet with us.

For application blanks and full particulars, address

M. M. FORBES, *Sec'y,*
803, 804 Candler Bldg., Atlanta, Ga.

New Jersey State Dental Society.

THE forty-seventh annual convention of the New Jersey State Dental Society will be held at Atlantic City, N. J., on July 11, 12, and 13, 1917.

The entire convention will be held on Young's Million Dollar Pier. Machinery Hall will be used for the exhibits. Dr. George W. Wakeley of Orange, N. J., is chairman of the committee, and with 25,000 square feet of space available expects to have the greatest display of dental goods in the history of the society. Machinery Hall extension, with about 10,000 square feet of space, will give ample space for clinics and meetings.

Dr. Charles A. Spahn of Newark, N. J., is chairman of the Clinic Committee, and will present some entirely new clinics. Dr. Raymonde A. Albray of Newark, N. J., chairman of the Essay Committee, has arranged for essayists of prominence, whose names will be announced later.

The headquarters of the society will be on the pier, and mail may be directed to exhibitors, clinicians, or members in care of the secretary of the New Jersey State Dental Society, Young's Million Dollar Pier, Atlantic City, N. J. A list of hotels where special rates may be secured will be published in the *Journal*, and mailed prior to the convention.

A cordial invitation is extended to ethical practitioners.

JOHN C. FORSYTH, *Sec'y,*
430 E. State st., Trenton, N. J.

National Mouth Hygiene Association.

DEPARTMENT OF EXTENSION LECTURES.

A COMPLETE lecture set, consisting of full manuscript and thirty-six specially selected and prepared lantern slides covering the subject of Mouth Hygiene, is furnished by this association to members of state dental societies and others who may be considered as qualified to present the subject on the lecture platform.

For rental and sale terms and other particulars address

EDWIN N. KENT,
Director of Extension Lectures,
330 Dartmouth st., Boston, Mass.

Indiana Board of Examiners.

THE next meeting of the Indiana State Board of Dental Examiners will be held in the State-house, Indianapolis, June 18 to 23, 1917, inclusive.

For application blanks and full particulars address

FRED J. PROW, *Sec'y,*
Bloomington, Ind.

Tennessee Board of Examiners.

THE Tennessee State Dental Board will hold its next meeting June 12 to 16, 1917, inclusive, at the Gayoso Hotel, Memphis, Tenn. Further information and application blanks can be obtained from

WALTER G. HUTCHISON, *Sec'y,*
Doctors Bldg., Nashville, Tenn.

Arkansas Board of Examiners.

THE Arkansas State Board of Dental Examiners will hold its annual meeting and examination at the Marion Hotel, in Little Rock, Ark., on Thursday, Friday, and Saturday, June 21, 22, and 23, 1917.

Applicant for examination must be a graduate of a reputable dental school. Examination theoretical and practical. Fee and application should be filed as soon as convenient, and at latest ten days before the examination. For further information address

I. M. STERNBERG, *Sec'y,*
Fort Smith, Ark.

Wisconsin Board of Examiners.

THE Wisconsin State Board of Dental Examiners will meet to give examinations on June 20, 1917, at Berlin Arcade Hall (4th floor), cor. Third and North, Milwaukee, Wis. Applications with fees and necessary preliminary credentials must be sent to the secretary twenty days before examination.

F. A. TATE, *Sec'y*,

Illinois State Dental Board.

THE Illinois State Dental Board will commence their next examination on June 15, 1917, at 9 A.M., at the Northwestern University Dental School, Chicago. Application blanks and further information can be secured from

O. H. SEIFERT, *Sec'y*,
Springfield, Ill.

Massachusetts Board of Examiners.

A MEETING of the Massachusetts Board of Dental Examiners for the examination of candidates will be held in Boston, Mass., June 22 to 30, 1917, inclusive. All applications must be in the hands of the secretary on or before June 12th.

For further information address

GEORGE H. PAYNE, *Sec'y*,
29 Commonwealth ave., Boston, Mass.

Mississippi Board of Examiners.

THE Mississippi State Board of Dental Examiners will hold its next examination in Jackson on Tuesday, June 19, 1917. Applicants for examination must be graduates of reputable dental schools, and will be required to take a written examination in all subjects pertaining to dentistry, together with a practical examination in operative and mechanical dentistry. The examination fee is $10. For further information address

H. J. ARLEDGE, *Sec'y*,
Poplarville, Miss.

Alabama Board of Examiners.

THE Board of Dental Examiners of Alabama will conduct an examination of applicants for license to practice dentistry in Alabama, at the Birmingham Dental College, in Birmingham, beginning at ten o'clock Monday morning, June 18, 1917. All applications, accompanied by necessary fee, with proper credentials, should be in the hands of the secretary-treasurer at least one week before the examinations begin.

For further information, application blanks, etc., address

H. CLAY HASSELL, *Sec'y-Treasurer*,
Tuscaloosa, Ala.

Virginia Board of Examiners.

THE regular annual meeting of the Virginia State Dental Board, for the examination of applicants to practice dentistry in Virginia, will be held in the city of Richmond, Va., June 12, 1917.

The board will convene at the Medical College of Virginia at 9 A.M. on the date above given.

For further information address

J. P. STIFF, *Sec'y*,
Fredericksburg, Va.

Nevada Board of Examiners.

THE next meeting of the Nevada State Board of Dental Examiners for examination of applicants who desire to practice dentistry in the State of Nevada will be held at Reno, Nev., beginning Thursday, June 7, 1917. Applications and preliminary qualifications, together with fee, must be with the secretary by June 4th.

For further information apply to

G. C. STEINMILLER, *President*,
Reno, Nev.
W. H. CAVELL, *Sec'y*,
Carson, Nev.

California Board of Examiners.

THE next examination by the California Board of Dental Examiners for licenses to practice dentistry in that state will be held in San Francisco, beginning on the 8th day of June 1917, at 9 A.M. This examination will be followed by one in Los Angeles, beginning on the 22d day of June 1917, at 10 A.M. All applications for examination must be filed with the board on the day set for the beginning of examination. Each application must be accompanied by (1) the fee of $25.00; (2) necessary credentials (diploma and license from other states); (3) testimonials of good moral character, and (4) a recent unmounted photograph of the applicant.

C. A. HERRICK, *Sec'y*,
133 Geary st., San Francisco, Cal.

Iowa Board of Examiners.

The next meeting of the Iowa State Board of Dental Examiners, for the examination of candidates, will be held at Iowa City, Iowa, commencing Monday, June 4, 1917, at 9 A.M.

For further information and application blanks address

J. A. West, *Sec'y,*
417 Utica Bldg., Des Moines, Iowa.

Missouri Board of Examiners.

The next meeting of the Missouri Dental Board will be held in Jefferson City, June 11, 12, and 13, 1917, commencing Monday morning at 8 o'clock.

Applications must be in the hands of the secretary ten days before examination. For further information address

V. R. McCue, *Sec'y,*
Cameron, Mo.

New York State Board of Examiners.

The State Board of Dental Examiners announce the following dates for dental licensing examinations in New York State for 1917 and 1918:

1917—June 26–30, inclusive; October 2–6, inclusive (New York City, Albany, and Buffalo).

1918—January 29–February 2, inclusive; June 25–29; September 24–28, inclusive (New York City, Albany and Buffalo).

M. J. Terry, *Sec'y,*
Albany, N. Y.

Nebraska Board of Dental Secretaries.

The Nebraska Board of Dental Secretaries will hold their next regular meeting beginning at noon, June 7 to 16, 1917, inclusive, except Sunday.

On June 7th, 8th, and 9th, practical examination will be given to this year's graduates of Omaha Creighton Dental College and Lincoln Dental College.

All others will begin their examination Monday morning, June 11th, at 8.30 in the State Capitol Building, Lincoln.

For further information address

S. A. Allen, *Sec'y-Treasurer,*
Loup City, Nebraska.

New Hampshire State Dental Board.

The New Hampshire State Dental Board will hold its next examinations on June 28, 29, and 30, 1917, in Masonic Banquet Hall, Manchester, N. H. Application blanks and further information may be obtained of

Harry L. Watson, *Sec'y,*
913 Elm st., Manchester, N. H.

South Carolina Board of Examiners.

The next annual meeting of the South Carolina State Board of Dental Examiners will be held at the Jefferson Hotel, Columbia, S. C., beginning promptly at 9 o'clock Tuesday morning, June 26, 1917. All applications to be in the hands of the secretary by June 16th.

Application blanks and full information may be obtained by addressing

R. L. Spencer, *Sec'y,*
Bennettsville, S. C.

Texas Board of Examiners.

The next meeting of the Texas State Board of Dental Examiners will be held in the central high-school building, Houston, Texas, beginning Monday morning, June 18, 1917, at 9 o'clock. No diplomas exchanged; no reciprocity.

The fee of $25 should be in the hands of the secretary not later than June 13th. For further particulars and application blanks address

C. M. McCauley, *Sec'y,*
840 Wilson Bldg., Dallas, Texas.

Pennsylvania Board of Examiners.

The next examination of the Pennsylvania Board of Dental Examiners will be held in Musical Fund Hall, 808 Locust st., Philadelphia, and the College of Pharmacy Building, Pittsburgh, on Wednesday, Thursday, Friday, and Saturday, June 13, 14, 15, and 16, 1917. The examination in operative dentistry will be held on Wednesday, June 13th, at 8.30 o'clock, in the Evans Dental Institute, 40th and Spruce sts., Philadelphia, and the University of Pittsburgh Dental Building, Pittsburgh; prosthetic dentistry Wednesday, 1.30. Application papers can be secured from the department of Public Instruction, Harrisburg. For further information address

Alexander H. Reynolds, *Sec'y,*
4630 Chester ave., Philadelphia, Pa.

Oklahoma Board of Examiners.

The next regular semi-annual meeting of the Oklahoma Board of Dental Examiners will be held in Oklahoma City, Okla., at the Skirvin Hotel, beginning June 25th. Only graduates of reputable colleges presenting fifteen units credit in literary work eligible to take examination. For further information write

H. Overbey, *Sec'y*,
Ryan, Okla.

Wyoming Board of Examiners.

The Wyoming Board of Dental Examiners will meet in Cheyenne on June 26 to 28, 1917, and all applicants holding reputable diplomas are eligible to the examinations. The examination fee of $25 must accompany the application, and be in the hands of the secretary fifteen days prior to the time set by the board.

For further information and for blanks, address

Peter Appel, Jr., *Sec'y*,
P. O. Box 643, Cheyenne, Wyo.

Michigan Board of Examiners.

The next regular meeting of the Michigan State Board of Dental Examiners will be held in the city of Ann Arbor, in the dental building of the Dental Department of the University of Michigan, June 18 to 23, 1917, inclusive. This meeting will be held for the purpose of offering an examination to all eligible candidates who wish to apply for a license to practice dentistry in the State of Michigan. All candidates must furnish the secretary with application and fee not later than ten days prior to examination. Applications and all other information may be obtained by addressing

E. O. Gillespie, *Sec'y-Treasurer*,
Stephenson, Mich.

New Jersey Board of Registration.

The State Board of Registration and Examination in Dentistry in New Jersey will hold their annual meeting and examinations in the Assembly chamber, at the State-house, Trenton, N. J., on June 25, 26, 27, and 28, 1917. License fee $25, re-examination fee $10.

Attention is directed to the following quotation from the dental law of New Jersey: "Applicant shall present to said board a certificate from the commissioner of education of this state, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study in an approved public or private high school, or the equivalent thereof." [Those who entered a dental college prior to January 1, 1914, must present a certificate showing a three-year high school course.] In accordance with this law the secretary will issue application blanks only upon presentation of the required certificate from the commissioner of education, State-house, Trenton, N. J.

Applications must be filed complete ten days before the date of the examination. Address all communications for further particulars to

John C. Forsyth, *Sec'y*,
430 E. State st., Trenton, N. J.

Maine Board of Examiners.

The Maine Board of Dental Examiners will hold its only meeting of the year at the State Capitol, July 12, 13, and 14, 1917.

Will S. Payson, *Sec'y*,
Castine, Me.

Montana Board of Examiners.

The Montana State Board of Dental Examiners will hold their next session for examination on July 9, 10, 11, 12, and 13, 1917, in Helena, Mont. Applications must be in the hands of the secretary ten days before the 1st of July.

For information, inquire of

G. A. Chevigny, *Sec'y*,
107 Clark Block, Butte, Mont.

Vermont Board of Examiners.

The next meeting of the Vermont Board of Dental Examiners for the examination of candidates to practice in Vermont will be held at the State-house, Montpelier, commencing at 2 p.m. on June 25, 1917, and continuing for three days.

To be eligible for examinations a candidate must be (1) twenty-one years of age, (2) a graduate of a high school of the first class, and (3) of a reputable dental college.

Applications must be in the hands of the secretary not later than June 15th. For further information apply to

Harry F. Hamilton, *Sec'y*,
Newport, Vt.

Rhode Island Board of Registration.

The Rhode Island Board of Dental Examiners will hold its next examinations on July 5, 6, and 7, 1917, in the State-house, in Providence.

For further information address

Ernest A. Charbonnel, *Sec'y*,
139 Mathewson st., Providence, R. I.

Examination of Dentists for the U. S. Army.

The Surgeon-general of the army announces that examinations for appointment in the Dental Corps of the Army will be held at Fort Slocum, N. Y.; Columbus Barracks, Ohio; Jefferson Barracks, Mo.; Fort Logan, Colo., and Fort McDowell, Cal., on Monday, May 7, and Monday, July 2, 1917.

Application blanks and full information concerning these examinations can be procured by addressing the Surgeon-general U. S Army, Washington, D. C.

The essential requirements to securing an invitation are that the applicant shall be a citizen of the United States, shall be between twenty-one and thirty-two years of age, a graduate of a dental school legally authorized to confer the degree of D.D.S., and shall be of good moral character and habits.

Successful applicants will be immediately appointed—as far as the number of vacancies will permit—to the grade of first lieutenant, at an entrance salary of $2,000 per annum.

In order to perfect all necessary arrangements for the examination, applications must be in the possession of the Surgeon-general at least two weeks before the date of examination; early attention is therefore enjoined upon all intending applicants. There are at present fourteen vacancies to be filled, and on July 1, 1917, there will be twenty-two additional vacancies.

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UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING APRIL 1917.

April 3.

No. 1,221,420, to Robert Meade Craig. Denture.

No. 1,221,586, to Arthur W. Powell. Dental floss holder.

April 10.

No. 1,222,144, to William M. Ruthrauff. Dentifrice.

No. 1,222,203, to Rupert E. Hall. Articulator.

No. 1,222,267, to Albert B. Cosad. Saliva ejector.

No. 1,222,377, to Bradford B. Flint. Identification device for toothbrushes and the like.

April 17.

No. 1,222,619, to George W. Gay. Anesthetic inhaler.

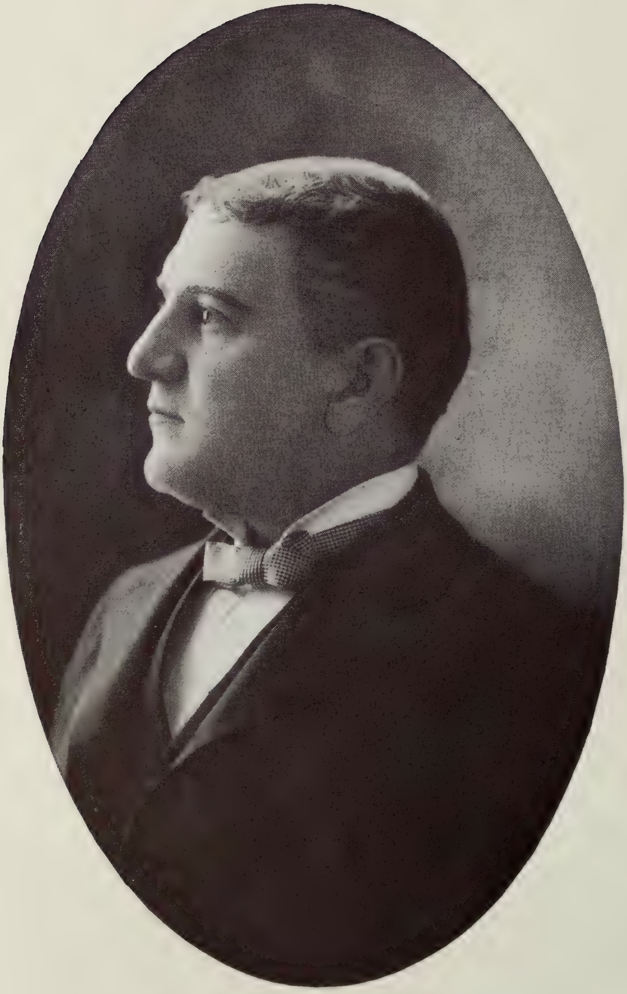
No. 1,222,773, to Herbert H. Kreutzmann. Composition for making dental impressions.

April 24.

No. 1,223,364, to Rutherford H. Bowsher. Artificial tooth.

No. 1,223,450, to George L. Van Allen. Artificial denture.

No. 1,223,783, to Frank Grant. Device for toilet use.



DR. FRANK HOLLAND.

THE
DENTAL COSMOS

VOL. LIX. JULY 1917. No. 7.

ORIGINAL COMMUNICATIONS

Further Consideration of the Pinlay (Posterior) and the Pinledge (Anterior) Bridge Attachments.

By JAS. KENDALL BURGESS, D.D.S., New York, N. Y.

(Read before the Northeastern Dental Association, Hartford, Conn., October 11, 1916.)

YOUR committeeman and my good friend, Dr. Dahlen, is responsible for my presence among you tonight and for the subject of my paper. I should have chosen another, but bespeak for him your kindly consideration when I shall have gone away.

His invitation requested me to show some models and to talk about the pinlay and the pinledge attachments. It seemed to me at first thought that I was on record with so clear a description of these attachments and the technique of their construction* that it would be scarcely worth your while and mine for me to attempt anything further along that line, and that I ought to offer something else instead. On further consideration, however, two things determined me to make the effort. The first is, that following the publication of the descriptive matter to which I have referred came numerous requests for more detailed information, models, etc., from such varied sources as to show widespread interest, all expressing approval, but many confessing timidity about entering into what was to them unexplored and consequently unfamiliar territory without the most minute and complete directions for their guidance. The second is that out of my years of experience has come the knowledge of some traps and pitfalls and the precautions necessary to their avoidance which should be valuable to any worker in this field. It would seem, therefore, that we might profitably take up a more detailed description of the technique of the preparation of the abutments and the construction of the pinlay and pinledge attachments, and bring these necessary precautions more sharply to your attention.

In order that we may have the picture more definitely in our minds, and each of us see the same picture, let us suppose a case in the lower right jaw where the bicuspids are missing and the first molar and the cuspid are normal teeth in size, length, position, occlusion, and stability, and that they are unmarred or practically so by decay or fillings, so that there shall be no obstacle to a normal procedure in preparation of the pinlay for the molar and the pinledge for the cuspid. The first points we must notice are the relative angles at which the teeth stand. If they are normal, as we have said, their crowns should lean somewhat toward each other, which means of course that if we follow each tooth in its axis from the occlusal surface to the apex of the root the distance between lines so drawn widens as we go downward.

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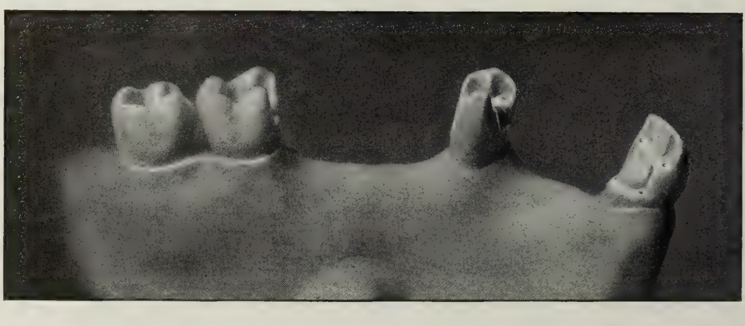
* See DENTAL COSMOS for June 1916, p. 645.

It is obvious, then, that if we prepare each tooth in its axis and without regard to its relation to its fellows, and construct a bridge on attachments made to fit these abutments, when it is completed we shall not be able to place the bridge in position for the reason that the distance between the cervical aspect of the attachments will be greater than the distance between the occlusal ends of the abutments between which this cervical portion must pass before it can rest at the cervix. It is imperative that we select some single line of direction as a basis of our operation on both teeth, either the axis of the molar or of the cuspid or a common angle between the two, so that when the work of preparation is completed the proximal planes, grooves, and cavity walls will all be parallel to each other, or preferably diverge very slightly in the direction from the cervix to the occlusal ends, and all pin openings in both teeth be parallel with each other and at a common angle with the proximal planes, grooves, and cavity walls. (The principle is shown in Fig. 1, except that being upper teeth they lean somewhat away from each other.)

Perhaps to some it seems trivial to enlarge on so self-evident a fact, but I do it for three reasons: First, because it *is* a fact, and no description of technique could be complete without stating it; second, because in any audience of dentists there are likely to be young men of small experience who have not had the opportunity to find out these apparently obvious things; and third, because it matters not what our experience or ability may be, this and other pitfalls are very easy to fall into unless we keep the knowledge of them constantly before us, and make a conscious effort to avoid them.

Fig. 1.



Having determined upon this angle we proceed to the actual work of preparation of the molar tooth.

TECHNIQUE OF PREPARATION FOR THE PINLAY ATTACHMENT.

The first function of a bridge attachment and the very object for which we construct it is to support one end of the intervening bridge. Our attachment, therefore, must offer on its proximal side a sufficient area of metal against which to make this union with the bridge. It seemed to me from the beginning that the best way to accomplish this was by slicing away a portion of the proximal side of the tooth, leaving a flat surface somewhat larger in circumference than it is necessary to have the joint of union between the bridge and the attachment (Fig. 2).

For this purpose I use a large saucer-shaped vulcarbo disk, No. 4,* mounted with the concave side away from the handpiece (Fig 2) and kept thoroughly wet while in use. In some cases I place the edge of the disk on the morsal surface near the morso-proximal angle, and bearing toward the cervix slice away the desired amount of tissue. In other cases I place the flat surface of the stone against the proximal contour of the tooth, and bear in the direction of the pulp until a sufficiently large flat surface has been formed. I call this surface the proximal plane. In either method of forming it the disk should be held in such relation to the tooth that a small portion of both morso-proximal and linguo-proximal angles are taken away, while the bucco-proximal angle is left as far as possible undisturbed. This serves two purposes—it avoids or greatly lessens the display of metal on the buccal surface of the tooth in the completed case, and it places the metal surface more into a linguo-proximal position, and therefore more completely into the field of the soldering operation. I make no attempt to form this plane with its cervical margin under the gum, as I have never seen the necessity for it. Sometimes in the case of the short tooth it does extend under the gum, but when it occurs it is merely incidental.

FIG. 2.

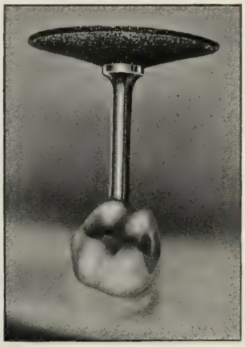


FIG. 3.

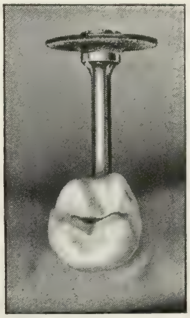
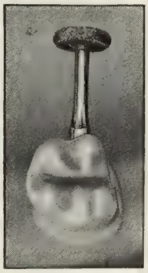


FIG. 4.



The second function of the bridge attachment is that of anchoring the bridge to its pier, and we continue our preparation with that end in view. The object is to form a cavity in the morsal surface of the tooth of such size, shape, and depth that when the attachment is cast and placed in it, even without the cement, it will be immobile, except in one direction—outward—at the same time taking care to encroach as slightly as possible on the inner tissues of the tooth beyond removing sufficient material to accomplish the object stated. This removal can be accomplished much better with stones than with burs, and with much less annoyance to the patient. For gaining an entrance through the enamel I use a small flat vulcarbo disk No. 6 (Fig. 3), and beginning at the center of the morso-proximal angle contiguous to the open space I cut a groove or slot in the mesio-distal axis of the morsal surface to about the depth of the enamel, or slightly below it, and extend it to include the remote limits of the sulci (Fig. 3). I follow this with a carborundum wheel or cavity-stone No. 44, preferably a slightly worn one (Fig. 4), and, by pushing and drawing, widen the groove, giving it somewhat of a fan-shape at the morso-proximal angle where it joins the proximal plane (Fig. 4). I follow this with an inverted-cone cavity-stone No. 70, preferably a slightly worn one (Fig. 5), cutting out all the sulci (Fig. 5).

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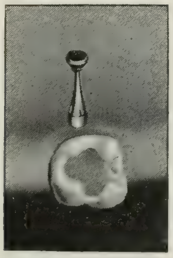
* The vulcarbo disks described are the S. S. White Dental Mfg. Co.'s, and have no equal for the purpose for which they are intended. The cavity and other ready-mounted stones, which I have referred to by number, are Miller's mounted points, made of carborundum by the Chicago Wheel and Mfg. Co. They come for straight and angle handpieces, and so far as I know are for sale by supply dealers everywhere.

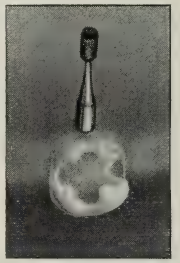
Fig. 5.



Now, beginning about the center of the proximal plane, and at a point about $\frac{1}{16}$ to $\frac{3}{32}$ of an inch below the level of the floor of the cavity, with the same somewhat worn cavity-stone of inverted cone or other type, with its base toward the cervix, I cut a vertical groove leading into the floor of the cavity, and from $\frac{1}{32}$ to $\frac{2}{32}$ of an inch deep in its mesio-distal aspect (Fig. 5). This I call the proximal groove. The cylindrical part of the attachment fitting into it forms a strong union between the inlay and contour parts of the attachment, and the pin to be set into the base of it adds materially to the anchorage at a point where much of the strain is brought in the work of mastication.

The preparation is now in the rough. With a No. 70 or 36 inverted-cone cavity-stone, with its base against the floor of the cavity, I flatten or slightly convex the floor to the line of its union with the walls, and with a No. 29 or 30 cylindrical cavity-stone (Fig 6) I smooth and parallel the walls of the cavity, round away any sharp points of enamel that may be formed by the union of the grooves where they meet at the center, and make very sharp at every point the angle of union between the walls and the floor of the cavity (Fig. 6). With this same cylindrical cavity-stone, with the end or base toward the cervix, I now shape and smooth the walls of the proximal groove, flatten the base or floor which we call the proximal shoulder, and sharpen the angle where wall and shoulder meet.

Fig. 6.

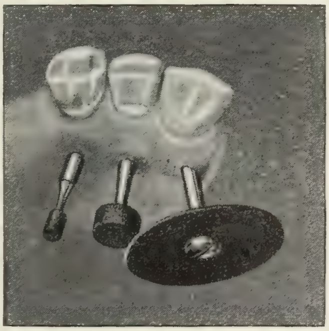


The preparation is now complete except for the pin openings, but before coming to these I desire to speak of several very necessary precautions: (1) These last two stones used for finishing should be new, with keen, sharp edges, in order that the preparation may be accomplished as described, so that when the attachment is placed it will grip and hold. Attachments made into a preparation with concave cavity floors, shallow, badly-formed sides, and rounding angles of union lack the power to grip, and throw almost the entire dependence upon the luting cement. (2) In the effort to form the walls exactly parallel, care should be taken that no undercuts remain, for reasons too obvious to mention. (3) In forming the cavity care should be taken to leave the peripheral enamel walls of sufficient thickness. I cannot give you the dimensions in millimeters. Your judgment must be your guide, remembering two things, that a great part of the lateral strain put upon the bridge in mastication is to be borne by these walls, and that enamel from which has been removed, by whatever process, all of its dentin support, is a very frail material. Then, too, we must remember that the narrower we can have our attachment, to properly serve its mechanical function, the less it will interfere with the very important esthetic function. (4) We should also avoid extending the cavity too deep into the dentin, and here again there are two reasons: (*a*) We must not forget that our tooth is vital and that there are many reasons for leaving it so and desiring it to remain so. The deeper we excavate, the larger the bulk of metal in the attachment, the closer this increased bulk is brought to the pulp, and the greater the likelihood of disturbance to that valuable organ. (*b*) The deeper we cut, the higher will be the peripheral enamel walls in proportion to their thickness, and the greater the danger of fracture. Here again the operator's judgment, aided by a consideration of all the details bearing upon the case in hand, must be his guide. The very reason for using the pins is that the cavity may be made shallower and the body of the attachment less bulky. In this work of preparation I always use water freely on the larger wheels, and sometimes on the cavity-stones. In many cases, however, I find dentalone* very valuable in mitigating the pain. I put two or three drops in a small receptacle, dip the beaks of the operating pliers into this, and carry a small quantity to the cavity, renewing it as the work of grinding dissipates it.

TECHNIQUE OF PREPARATION FOR THE PINLEDGE ATTACHMENT.

Before going farther with the molar preparation, we proceed to the cuspid. With the same large vulcarbo disk No. 4 (Fig. 7) bearing against the linguo-proximal angle contiguous to the open space, I grind away sufficient tissue to flatten the angle somewhat, taking care to grind at such an angle that the anterior enamel plate is left undisturbed (Fig. 7, central). This for two reasons: First, to preserve the contour of the tooth, and second, to keep the metal out of view in the finished work. Now, with a ready-mounted carborundum stone No. 43 or 44, with a keen edge and with its base toward the cervix, I cut a notch across the lingual surface of the tooth just short of the cervical shoulder and to about the depth of the enamel (Fig. 7, lateral). This I call the cervical notch. I then cut a similar notch about one-half or two-thirds of the distance between this point and the incisal end of the tooth, which I call the incisal notch (Fig. 7, lateral.) Following this with a No. 29 or 30 carborundum cavity-stone (Fig. 7) with its base in the center of the cervical notch pointing toward the cervix, bearing labially with a slight inciso-cervical movement I cut a vertical groove the width of the stone and to a depth of

Fig. 7.



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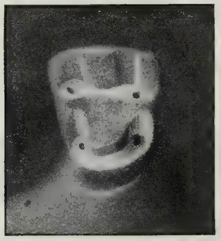
* Dentalone is a saturated solution of chloretone in essential oils made by Parke, Davis & Co., and may be had through your supply house.

about one-half or two-thirds the diameter of the stone—deep enough so that when the stone is brought to rest and pressed toward the cervix it will hold securely against the shoulder thus formed, but not deep enough to endanger the pulp (Fig. 7, cuspid). These are the cervical groove and ledge.

Where conditions make a still greater security of anchorage desirable, I cut two similar grooves and ledges instead of one in the cervical notch, beginning at the mesio-lingual and the disto-lingual angles respectively, and bearing toward the pulp. These are the mesio-cervical and the disto-cervical grooves and ledges. (Fig. 8.) I follow these with two similar grooves in the incisal notch, beginning at or near the mesio-lingual and disto-lingual angles respectively, and bearing in each instance labially or slightly toward the pulp. These are the mesio-incisal and the disto-incisal grooves and ledges (Fig. 8). Their exact length inciso-cervically, their depth linguo-labially, and their exact position must all be determined by the length, width, thickness, and shape of the tooth in hand and the angle at which it stands, but no operator should have any difficulty in forming instant judgment with one glance at the tooth.

Fig. 8.



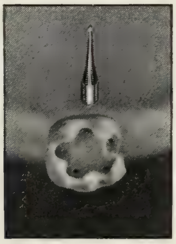
Care should be taken in every case not to encroach dangerously near the pulp nor to injure the anterior plate of enamel. These grooves should always be finished with sharp keen-edged stones, so that their sides shall be straight and smooth, their floors or ledges perfectly flat, and the angle of union between the floor and sides very sharp. Here, as in the case of the pinlay for the posterior tooth, the gripping and holding quality of the attachment depends largely upon straight sides, flat ledges, and sharp square angles. The preparation of the incisal ends of these abutments depends upon the case in hand. The greatest measure of protection is afforded, of course, by beveling the linguo-incisal angles of the lower teeth, and constructing the attachment so that all the stress is brought upon the metal.

It can be seen readily that with such a bridge as we are considering in position, the chief danger of disturbing the relations would be through biting on the incisal end of the tooth, and driving it off the attachment. This can be obviated in the manner just described. I have not felt it necessary in many cases, and avoid the display of metal it would entail, small though it be, wherever possible. Except in the case of the edge-to-edge bite this consideration does not often arise with reference to the upper teeth. In such cases, however, it is met in the same way by beveling the linguo-incisal angle and building the attachment so that the tooth itself is relieved of any direct pressure. In most cases the preparation of the notches and grooves as described makes ample room for the bite against the lingual surfaces of the upper anterior teeth. As the metal need not be very thick, not much space is required. Where the bite is very close, however, and such preparation does not suffice, I do not hesitate to supplement it by shaving the incisal ends—or, more properly, the labio-incisal angles—of the occluding teeth.

The stone work being complete we come to the drilling of the openings for the pins. I rarely drill these openings in any of the teeth until all are ready to receive them, for the reason that I find it easier by that method to get them at a uniform angle. They are made with a spear drill, which I fashion myself from a No. ½ revelation bur (Fig. 9). I prefer the drill to the bur because it cuts more keenly and maintains better the size of the openings. They may be used in either the straight, the right-angle, or the contra-angle handpiece.

The openings are drilled to a depth of about $\frac{1}{16}$ to $\frac{3}{32}$ of an inch, and vary in number with the tooth and the case. There are usually three or four in each anterior tooth, two or three in the bicuspids, and three or four, and in very infrequent cases five, in the molars. I place one in each ledge in the anterior teeth near its center, keeping preferably toward the proximal rather than toward the pulp side of the center (Fig. 8). In the posterior teeth I place one always in the proximal shoulder near its center, and one near each extremity of the cavity (Fig. 9). The effort always is to keep far enough from the enamel edge to avoid the risk of splintering or chipping it, and far enough from the pulp to allow an ample margin of safety. I consider the pulp first always, as regards both position and depth of the openings, and keep as far as possible from it, allowing only room enough to protect the enamel.

Fig. 9.

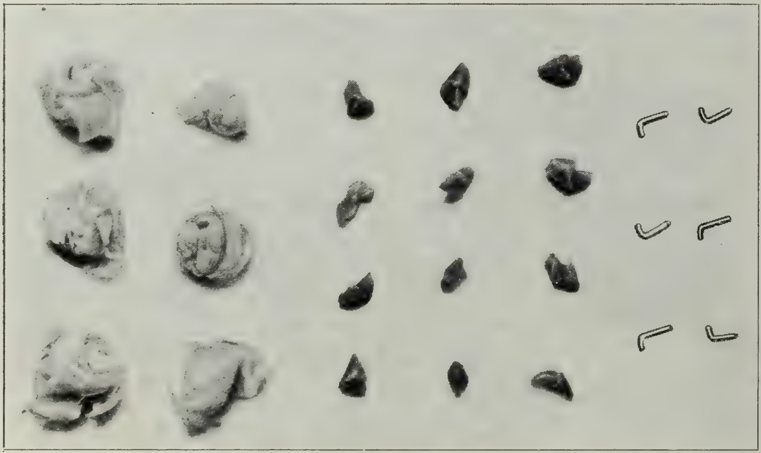


The drilling of the openings is simple enough, but getting them parallel seems to be the bugaboo of most operators who have questioned me about them. That I find, however, just as simple and requiring no special apparatus, but depending largely upon the manner of grasping the handpiece and the muscular action observed in handling it. I use the straight handpiece wherever possible, and the contra-angle where I cannot use the straight one. With the drill in the handpiece, but without revolving it, I place it in position in relation to the various teeth, and test and determine the common angle at which it seems best to drill all the openings; then I drill one opening at that angle, it scarcely matters in which tooth or at which point. Having drilled this opening I lift the drill out, holding the handpiece firmly in my fingers as in a vise and without changing the position or relations of fingers or hand or wrist to it, but with the elbow supported against the side, and moving the arm from that as a pivotal point I carry the drill to the location for the next opening, and drill that. Now, lifting the drill out, and with the same movements, I return and drop it into the first opening, not for further cutting but merely to test the angle. If it drops in readily without my having to tilt or change the angle of it, I know these two openings are parallel. Handling my arm and the handpiece in the same manner I proceed to the third opening, and having drilled that I return to the first or second or both, and test the angle again. And so I proceed in order until all the openings are made, testing constantly, and frequently carrying the drill from the last opening made to the one most remote, allowing it to drop into place, that no doubt may remain as to the correctness of my work. By this method of proving each opening before the next is made any number of teeth may be included and any number of openings made without experiencing any difficulty, at least so far as that part of the work is concerned, in placing the bridge.

TECHNIQUE OF CONSTRUCTION OF PINLAY AND PINLEDGE.

The preparation is now complete, and I take up the work of construction, which I begin always with the preparation of as many pins as are needed for the case. These pins are made of 24-gage wire, and I have always used iridio-platinum. Clasp metal wire might suffice, but in so small a size I should scarcely expect to find the strength I desire, and would use it only in the event of being unable to get the iridio-platinum. With a fine file I remove the sharp edge left by the excising forceps or shears, and grasping the wire with a small pair of flat-nose pliers I bend it at right angles, making a pin of from $\frac{1}{16}$ to $\frac{3}{32}$ of an inch in length. I cut it off just beyond the bend. The elbow thus formed serves the double purpose of making the pin easier to handle and of holding it more securely in position when the wax is flowed around it (Fig. 10). For this reason, too, I like to have the pin long enough so that the elbow stands a little above the floor of the cavity when in position.

Fig. 10.



I come now to the fitting of the matrix. At this point the rubber dam may be applied if the operator desires, though I rarely find it necessary. I have been asked a number of times why I advocate the use of the matrix and whether the pinlay cannot be made without it. It can and is being made without it, but I prefer the matrix because, frankly, I think in my own hands it makes the work not only easier, but more accurate. When once fitted and in position there seems to me something more definite and tangible about it. The attachment is really formed in skeleton or outline; one can see and examine it as to fit, and if there are any defects they may be corrected at this stage and disappointment saved later. The filling in and completion of the wax model after the matrix is properly constructed are mere matters of routine.

The matrix gives a solid base or foundation against which to secure the pins so that one may be much more certain of their retaining their correct positions during the further progress of the work. In addition, the metal covering the proximal plane gives a better foundation upon which to reconstruct the proximal contour ground away in the work of preparation, and which is to serve as the bridge support. So from my own point of view there are ample reasons for the use of the matrix. I know that some operators have balked at it, but whatever difficulties they have experienced have been due, I believe, to two causes—first, the use of too thick a metal, and second, improper technique in handling metal of any thickness. I use pure gold $\frac{1}{1000}$ of an inch in thickness. This I find thin enough to be readily adapted, and heavy enough to hold the adaptation with careful handling. I cut a piece large enough so that when carried to position it will cover all margins both of cavity and proximal planes (Fig. 11). It should be smooth and well annealed. There should be prepared also a number of balls of bibulous paper about the size of the end of the little finger (Fig. 10). I place the gold lightly in position over the cavity (Fig. 11), and with a ball of the paper in the pliers begin pressure, not in the center of the cavity, but at the morso-proximal angle, and in the direction of the pulp.

The paper rolls are now packed into the gold, piece after piece, using an instrument or pliers in each hand and forcing it into the cavity and down into the groove much as if we were putting in a paper filling (Fig. 12).

FIG. 11.

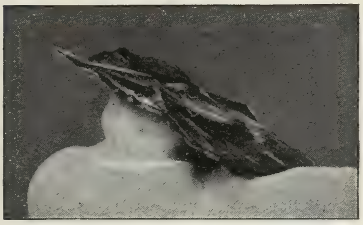
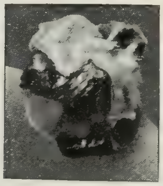
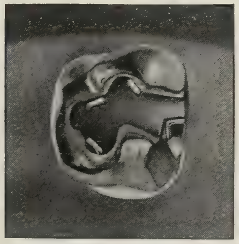


FIG. 12.



When it is carried thus fairly well to position I take a large round or egg-shaped burnisher, and burnishing from the inside outward I define well all margins of the cavity and proximal plane. I then remove the paper, lift the gold out, and trim away the surplus, leaving a narrow margin all around the cavity part, but cutting fairly close to the margins of the proximal plane. This latter leaves no surplus to be burnished under the contours of the tooth and interfere with removing the completed wax model. The matrix is now annealed and replaced, and by the same process of packing the paper balls into the gold lining it is carried against the tooth at every point, and especially into the angles formed by the meeting of the floor and the walls of the cavity. The proximal plane of the matrix is similarly burnished and fitted under paper. I rarely burnish directly against the metal. It is not necessary and it makes it harsher and more springy, and consequently more difficult to handle. The paper is now removed, and the metal should lie dead to position. With a sharp instrument the metal is punctured into the pin openings, and the pins are placed in position. They are easily handled by grasping the elbow with the operating pliers (Fig. 13).

FIG. 13.



FORMULA FOR CASTING WAX.

At this point I begin to use adhesive wax and as it is very essential that the wax shall be also a good casting wax, I think I ought to repeat the recipe for the kind I use: Melt together 3½ oz. of white wax, 1½ oz. of gum dammar, and add ½ oz. rosin. When thoroughly melted stir well and pour into receptacle. A number of bits of this wax should be prepared before the pins are placed (Fig. 10). With a pointed instrument barely touched to a piece of wax it is carried and placed at the juncture of pin and matrix and flowed around the pin and against the matrix with a moderately heated blade burnisher. Care should be taken not to overheat the burnisher, and so flow the wax through the pinhole and between the matrix and the tooth. This must be guarded against especially in cases where the matrix is split. As an additional precaution to keep the matrix from being held fast in the cavity by overheated wax, the cavity should be wiped out with a lubricant before the matrix is replaced after the final annealing. The process described is repeated with each pin until all are secured. In the same manner a film of adhesive wax is flowed over the proximal plane of the matrix. A piece of inlay wax the size of a buckshot is then cut, warmed, and flattened by pressing between thumb and forefinger, and pressed to position against the proximal plane. This is to form the proximal contour. Adhesive wax is flowed against this piece from the cavity side, securing it in position (Fig. 14), and bits of inlay wax melted into the cavity until it is as full as desired.

Fig. 14.

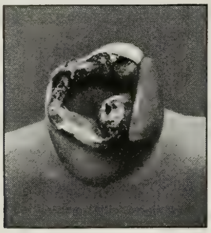
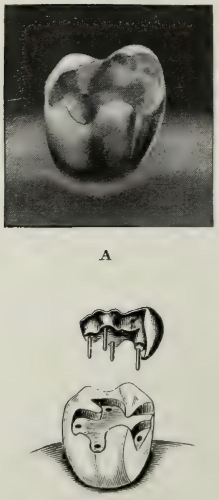


Fig. 15.



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The wax model is now formed in the rough, and with burnishers and carvers it may be finished to the margins and to the operator's standard as to cusps and sulci, and the proximal contour may be shaped as required or desired (Fig. 15). The occlusion may be adjusted after the removal of the rubber dam, if it has been used. The whole should now be thoroughly chilled, teased out of the cavity, and carried through to the completion of the casting process as any other inlay would be. I have my own cast in 22-k. gold. I think it casts into the matrix rather better than 24-k. and makes a stronger attachment.

Fig. 16.

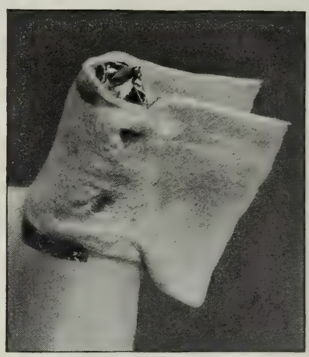
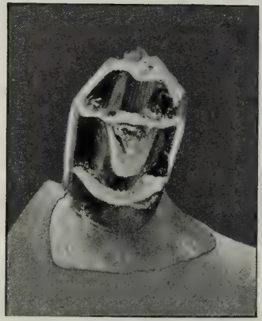
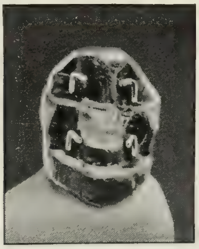


Fig. 17.



The principle of constructing the pin-ledge for the anterior tooth is precisely the same up to the point of withdrawing from the tooth for completion. The gold is cut sufficiently large to cover all margins, and is burnished approximately to position under several layers of bibulous paper (Fig. 16). The margins are all well defined (Fig. 17). The piece is removed and trimmed to the margins without leaving any surplus. It is annealed, the surface of the cavity lubricated, and the matrix replaced and carried well to position, special care being taken to fit it accurately into every part of the angles.

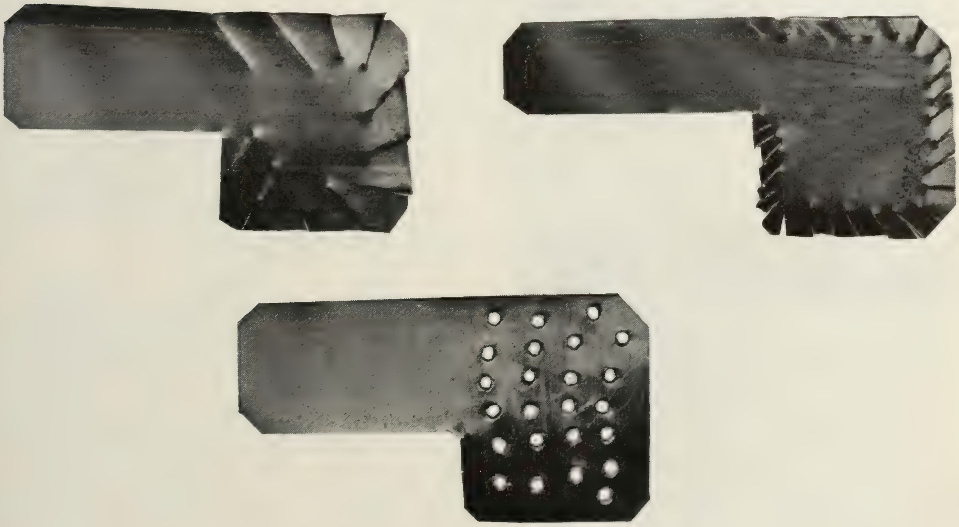
Fig. 18.



It is punctured into the pin openings and the pins are placed and waxed into position as described in the directions for pinlay construction (Fig. 18). A sufficient quantity of adhesive wax is now flowed over the entire surface to stiffen it, care being taken that it is not flowed over the margins against the tooth, or difficulty may be experienced in removing it. All margins are burnished thoroughly to position with a warm burnisher. It is then chilled, and with a pointed instrument in each hand is teased out and removed for completion.

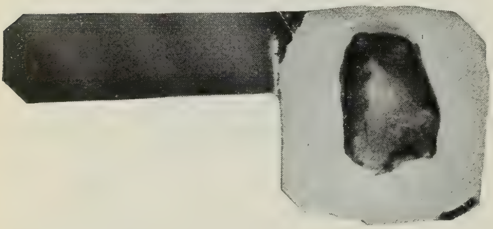
If desired it may be waxed to form and to occlusion and cast. I prefer, however, to solder it and proceed as follows: I keep on hand a number of home-made receptacles, which I call investment trays, for use with small investments. They are made of nickel-silver or other plate of about 30 gage and about $\frac{3}{4}$ of an inch in diameter, and cut so as to leave a handle $\frac{1}{2}$ inch long by which to grasp them after the investment is poured on. The bowl part is clipped around the edges, punched with a plate punch, or otherwise roughened so that the investment material will adhere to it (Fig. 19). By this means investments may be made smaller, much more easily handled, and more quickly heated. I mix to a creamy consistence in the palm of my hand as much inlay investment compound as can be picked up on the point of an ordinary plaster spatula. With a small instrument I fill carefully around the pins and out to the margins of the attachment, cover the bowl of the tray, and place the attachment on it, seeing that the margins are covered but do not sink into the compound (Fig. 20). When thoroughly set and the wax heated and absorbed with a bit of bibulous paper I flow sufficient 20-k. solder into the

Fig. 19.



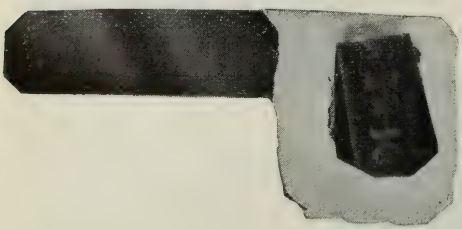
notches and grooves to fill the irregularities. Then, laying over this a piece of 22-k. solder cut roughly to size and shape—not necessarily exact but sufficient to cover the margins (Fig. 21)—I heat carefully till it sweats to position and the overlapping edges barely melt back to the shape of the outline of the margins (Fig. 22). On account of the thinness of the gold base it is necessary to do the entire soldering operation with a very gentle flame.

FIG. 20.



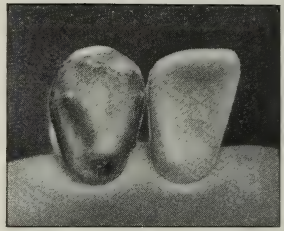
All matrices, whether to be filled by casting or soldering, should be thoroughly cleansed with alcohol or dioxid before investing, otherwise a film of saliva or blood which may have found its way there might be invested with it, and burning out, be replaced by a film of metal, interfering with a perfect fit. Before attempting to adjust attachments, whether cast or soldered, to position for taking the impression, they should be examined with a magnifying glass for bubbles of metal or other irregularities that will interfere with perfect seating. I have found that the unaided eye cannot be depended upon for such work.

FIG. 21.



I have gone into great detail in describing this technique to you, and some may have gained the impression that it is very complicated, but I do not doubt that if I should go with equal minuteness into the details of the technique of any operation with which you are familiar it would appear equally complicated to those not familiar with it. Following the publication of my paper in the December COSMOS, among many other requests came one from a dentist for a clinic in my office, and one from another dentist to prepare two abutments in his own mouth. I brought these two together and complied with their requests, but going farther, and constructing both attachments ready for completion. When I was finishing, the dentist who was observing said that in reading the article he had gained the idea that the work was complicated, but that what impressed him as he watched the progress of it was its great simplicity. His observation bore out my own experience. I have described to you my own methods, but to deny that there is room for some variation of the details which might better suit your style of operating in arriving at the same result, would be to dis-

FIG. 22.



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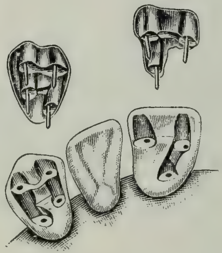


B

credit your individuality. The technique is the same for abutments in whatever part of the mouth, and as compound attachments and stabilizers are but amplifications of the pinlay or the pinledge or both, so the technique of their construction is but an elaboration of that described.

149 Broadway.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

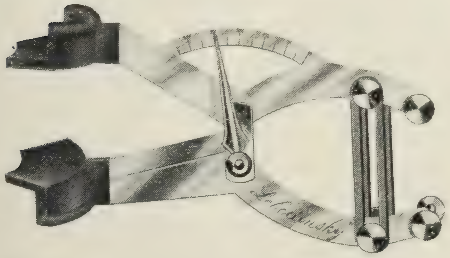
An Appliance for Maxillo-facial Mechanotherapy (Lebedinsky).

By EMILE LINET, Paris, France.

ABSTRACT OF A TRANSLATION FROM THE ORIGINAL FRENCH.

In November 1915 Lebedinsky conceived the idea of this instrument, whose purpose is to overcome contractures of the mandible. Its advantage is that it works gradually, progressively, and painlessly, and that its action can be definitely measured and controlled. It is applicable whether the contracture be of cutaneous, articular, or muscular origin, or of a combination of these.

FIG. 1.

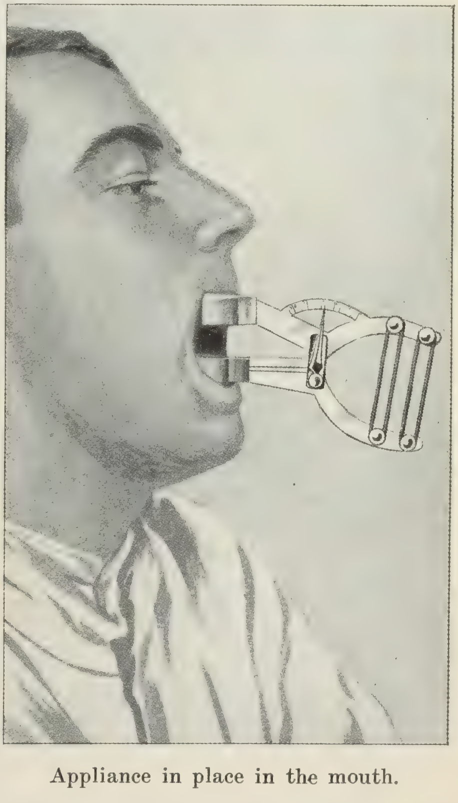


Appliance equipped with the protectors and one pair of elastics.

In spite of the varieties of contracture of the jaws which have been observed this appliance has considerably ameliorated and most frequently cured in a few weeks excessively obstinate cases. In the course of a year no contracture has been encountered which was irreducible, or which justified surgical intervention.

The appliance (Fig. 1) consists of two levers of the first class connected together at the fulcrum point. As is seen, one end of each lever bears a small strong tray, into which fits a piece of soft rubber to protect the teeth. The

FIG. 2.



Appliance in place in the mouth.

other end of each lever, *i.e.* the "force" end, bears two pairs of knobs which serve for the attachment of elastic rubber bands. Such bands, of known strength, are supplied with the appliance. The superior lever carries a scale, upon which a pointer upon the lower lever registers in millimeters the vertical distance between the two trays, *i.e.* the separation distance of the jaws.

The instrument is employed as follows: If the jaws at the beginning of the treatment are far enough apart to permit one to introduce the trays with the soft rubber protector for the teeth, this is done. If, however, which is occasionally the case, the jaws do not offer separation enough to permit of the introduction of the trays plus the rubber protector, the latter is left off. However, even in such cases, after one treatment the separation is sufficient to continue with the rubber protector. When the trays are in place, rubber bands are attached to the knobs at the "force" end of the appliance. The tension tends to open the jaws (Fig 2); instinctively, or volitionally if necessary, the patient tries to close his jaws. In this way an automatic massage is instituted which tends to restore normal tonicity and function to the masticatory muscles. Such exercise is performed for five, ten, and even twenty minutes, twice a day. In from eight to ten days, although sometimes it takes longer, the patient can open his mouth normally.

In the case of long-standing contractures, rubber bands are employed, totaling 10 to 12 kilos, to begin with. The operator must make judicious use of the power of the elastics in relation to the tolerance of the patient. The progress accompanying this treatment is readily shown by the indicator on the gage.

The mechanical principles are at once the simplest and the most powerful. Unqualified success has apparently followed the use of this appliance. Great emphasis is laid upon the following features: That the appliance works slowly, progressively, and painlessly; that it gently stimulates the muscles to resume their physiologic functioning, and that its action can daily be observed, recorded, and controlled.

Determining the Shape of the Normal Arch.

By PERCY N. WILLIAMS, D.D.S., New York, N. Y.

(Read before the Maryland State Dental Association, Baltimore, in November 1916.)

THE truly scientific man is the one who has a real thirst for knowledge. He rises above all selfish interests, and steadfastly fixes his mind upon one purpose—to find truth. He is not concerned in, nor is he diverted from his chosen path by, the opinions of others, unless those opinions are based upon established facts. He is afraid of no form of criticism except falsehood.

In an investigation of a scientific nature I have always felt that it was the duty of the investigator to collect facts, to elaborate and correlate them, and lay his results before the profession, avoiding so far as possible any attempt to force conclusions. This I have tried to do. I have nothing to withhold, nothing to conceal. I have gone back to first principles in nature; nobody can go farther than that, and I am absolutely sure of where I stand. What I shall state tonight will be based upon facts, and facts only. My only fear is that I may be misunderstood, as this is a difficult subject to discuss, and still more difficult to illustrate. I am well aware of the fact that no subject of unusual scientific interest is ever laid before the profession, be it in the form of a paper or clinic, that it does not bring down on the head of its author a storm of criticism, and the unfortunate part of it is that most of such criticism is of a destructive character. We all welcome that form of criticism which is constructive in its effect, but we abhor the ever-present destructive critic who is forever pulling down but never building up. He is well described in the good Book where it says, "The fool hath said in his heart, 'There is no God.'"

I hope this paper will be freely discussed. If the gist of it is truth, anything that may be said cannot change it; if it is false it deserves to be exposed. I do not claim originality for everything mentioned here. Many methods pertaining to orthodontic procedure have been advanced by different authorities in the past, each claiming originality for his particular method, only to learn later that it was used by someone else twenty or more years ago. I have quoted several authorities, and in each case have given credit whenever possible.

The object of this paper is to offer to the profession a flexible working hypothesis by which the general practitioner, as well as the skilled orthodontist, may be able to determine, in a deformed arch, and before the work of correction is begun, the correct position that each tooth should occupy in the normal arch.

Like many other phases of human activity, before progress can be made it becomes necessary to break down certain traditions, and to overcome some obstacles. As this investigation has progressed, we have been confronted with the traditional expression that the human arch varies according to type. Of course the meaning of this statement will depend somewhat upon how it is interpreted. The early writers upon this subject may have borrowed or appropriated the views of the anthropologists, and wished to convey the idea that different racial types had differently shaped arches. It is of course true that during the process of evolution certain changes in the shape of the arch have taken place, but we as orthodontists, desirous of obtaining all practical knowledge bearing upon the shape of the arch, are not so much concerned with the maxillæ of prehistoric tribes as we are with the modern normal type of man as we see him today.

THE GENERAL BELIEF THAT "THE ARCH VARIES ACCORDING TO TYPE."

I have tried to trace the origin of the expression, "The arch varies according to type," and I am at present unable to discover who is responsible for it. I find it quoted in almost all modern works on orthodontia, and the interesting part of it is that not one of the writers uses the phrase with quotation marks. I assume by this that each wishes to convey the idea that he is responsible for it, and considers it true. One well-known author and editor makes the statement in his book, and not wishing to place a wrong interpretation upon it, I wrote him as follows: "Will you kindly tell me how one is able to determine the shape of the normal arch for a given type?" His answer was —"In reply to your question as to how one is to determine the appropriate type of the arch for a given case, I can only say that you must take into consideration the shape of the head and the face in order to determine the shape of the dental arch. By that I mean that an individual with a short round face could not be expected to have the same shaped dental arch as the individual with a long narrow face. What we mean by the shape of the dental arch varying according to type is very well seen in two skulls which are shown in Dr. Cryer's 'Internal Anatomy of the Face,' illustrating two extremes which we very often see."

Referring to the two extremes in Cryer's work, we find one arch of the Caucasian race, and one of the Fan tribe of West Africa. Few of us have seen a member of the Fan tribe of Africa, hence the shape of his arch does not interest us in the least. If his arch suited his type only, and some of us are wearing that shaped arch, then it is our misfortune, and not something that we would voluntarily bring down upon—or to speak more correctly, into—our own heads. There is nothing to indicate that either of these skulls is a normal or typal form of the tribes they represent, so they are of little value to us. We are not interested in the shape of the arch, skull, or any other anatomical parts of any race or tribe whose physical characteristics do not conform in a reasonable degree with well-known recognized standards in art.

Before proceeding farther, let us examine into the truth of the statement that the arch varies according to type. Having been interested in art as a hobby for several years, I accepted an invitation recently to attend a class in portrait painting at the Art Students' League in New York City. I saw there twenty students painting the head and shoulders of the model, a woman about thirty-five years of age. Many of the canvases were well along; I should say some were about three-fourths finished. I listened attentively to a criticism of each picture by the instructor. Some were all out of proportion and devoid of artistic merit; others were artistic in a degree, but lacked symmetry. Two or three conformed in nearly every way to a correct interpretation of the model. Now, had there been no critic possessed with authority and knowledge to pass upon the work, each student could have set up the claim that his conception was correct.

It is logical to assume that, given equal artistic ability, those who excelled in painting the model did so because they had grasped and mentally assimilated certain definite and fixed laws in art. They possessed sufficient knowledge of artistic anatomy and of the various planes of the face to enable them to correctly reproduce what they saw before them. There are of course recognized laws and standards in art; some date back to the Greek conception of art. In this connection I wish to quote from a well-known authority, John Vanderpoel:

> Rules have been laid down by which an ideal standard has been sought to be fixed, the deviation produced by age and sex being taken into account; and while such standards are more or less artificial, and not to be slavishly followed to the extent of producing an unnatural uniformity, they certainly are invaluable as expressing a mean which cannot be deviated from to more than a limited extent without transgressing the laws of nature, and producing deformity.

It is this mean or average, as applied to the American type, that I wish to discuss. This constitutes a study in artistic anatomy, and involves an examination into the superficial and underlying structures which produce the lines, curves, and planes of the different parts of the face. The skeleton, with its bony prominences, furnishes a constant or fixed point in the surface of the figure. The muscles and their tendons produce the great variations of local form in different persons in different attitudes.

It is impossible for one to have a true conception of anything in life unless such a conception is based upon the normal as we understand it. If we paint a picture of man, we do not paint a hunchback. If we wish to convey by means of brush and canvas our conception of a beautiful woman, we do not paint her with a hare-lip. If we wish to have a true mental image of a dental arch, we must base our conception upon the normal, not upon the arches as we see them in everyday life. Of these arches 97 per cent. are too narrow, hence we find our sense image distorted when we come to express it in a tangible way, as in orthodontics and the construction of artificial dentures. I have already mentioned the fact that I have been unable to trace the source of authority for the statement that the arch varies according to type, but wherever it may have originated, I am convinced that, as it is understood today, there is no basis of truth for such a statement. It is one of those traditional beliefs which we find in all walks of life, constantly springing up and blocking progress. True it is that a person with a long narrow face may have a long narrow jaw, and a person with a full round face may have a broad jaw, but to select two extreme types, which may or may not conform to recognized artistic standards, and from these to formulate a law that arches vary according to type, is illogical and of little value. If the arch varies according to type, let us carefully and in a painstaking manner first determine the type we have to deal with, and before we can decide that a certain type possesses a characteristic arch, it will be necessary to make a very large number of measurements.

MIXTURE OF RACES AS RELATED TO TYPICAL ARCH FORMS.

I personally have felt that two thousand arches, all of which must be free from any marked irregularity, must be measured before the desired data could be secured. Consider, if you please, that there are at the present time over thirty-five distinct and pure-blooded races existing as American citizens in the United States, and then consider the enormous amount of mixed blood as the result of intermarriage of these races, and if the arch varies according to type, there must be a fairly large variety of dental arches in the United States. It may be that at some time in the future an exhaustive investigation will reveal in just what way the shape of the arch varies in different races, and we may be very much surprised to find that, as is the case with the teeth, an obscure race in the wilds of Africa may have the same shaped arch as an American statesman. We are concerned with the shape of the arch of the average good-looking, well-developed, and normal American type, free from any conspicuous deformity, and conforming, at least within certain limits, to fixed standards in art.

It is the variation in the arches of men of this type about which we are very much concerned, and my paper will be limited to a discussion of this average American type, such, for example, as the two young moving-picture stars, Miss Shirley Mason and Mr. George LeGuere, with the McClure Picture Co. Here we see types of American citizens conforming in many ways to recognized standards in art. There are none of us who, had we been called upon to render orthodontic treatment for these individuals when they were children, but would have been delighted with the results if we could have predetermined the present shapes of the arches, and assisted nature in giving them the normal arches and splendidly shaped heads which are shown in the photograph. (Fig. 1.)

Fig. 1.

Showing splendid examples of the American type.*

In attempting to analyze just how the arch varies to harmonize with various types we are confronted with some serious obstacles. One is that it is absolutely impossible to accurately determine the type of any person at a time in that individual's life when orthodontic treatment is most desirable. The other is that we are given a certain number of teeth, all of which must be contained within a curve of given length. In a discussion upon the question of type, I wish to quote Mr. S. C. Pietro, a well-known sculptor in New York. He said to the writer lately, "It is impossible to determine what type an individual will assume until maturity; this varies with different races, but I would say that, as a rule, in our country [meaning the United States] a woman does not fully mature until nearly thirty, and a man may continue to grow until he is thirty-five." This point is well illustrated in a certain people who possess strong racial characteristics. The female is at eighteen slender of build, delicate, and pretty; at thirty-five, when the racial characteristics begin to show, she becomes stout, coarse-featured, and altogether a changed woman, typical of her race. It is obvious, then, that if we are to meet and overcome each of the above mentioned difficulties, it becomes necessary to know in advance the length and shape of the curve which eventually will contain all of the permanent teeth.

CONFLICTING OPINIONS WITH REGARD TO NORMAL ARCH FOR A GIVEN TYPE.

There seem to be so many conflicting opinions as to the shape of the arch, with a total absence of definite laws or standards, that it seemed advisable to learn if there was such a thing as uniformity of opinion. So I conceived the idea of securing a photograph of an individual who possessed natural normal occlusion. (Fig. 2.) I then measured the teeth, noted their arrangement carefully, and secured a duplicate in artificial teeth; I then wrote the following letter to ten well-known men in the profession:

My dear Dr. Blank,—I am taking the liberty of writing to ask you to assist me in some research work I have been doing for the past two years. I wish to have the opinion of eight or ten well-known authorities in the profession as to the shape of the dental arch for a given type. Knowing that there is a conflict of opinion upon this important subject, I have undertaken to secure data in the following manner: I wish to send you a model, together with sheet wax and an upper

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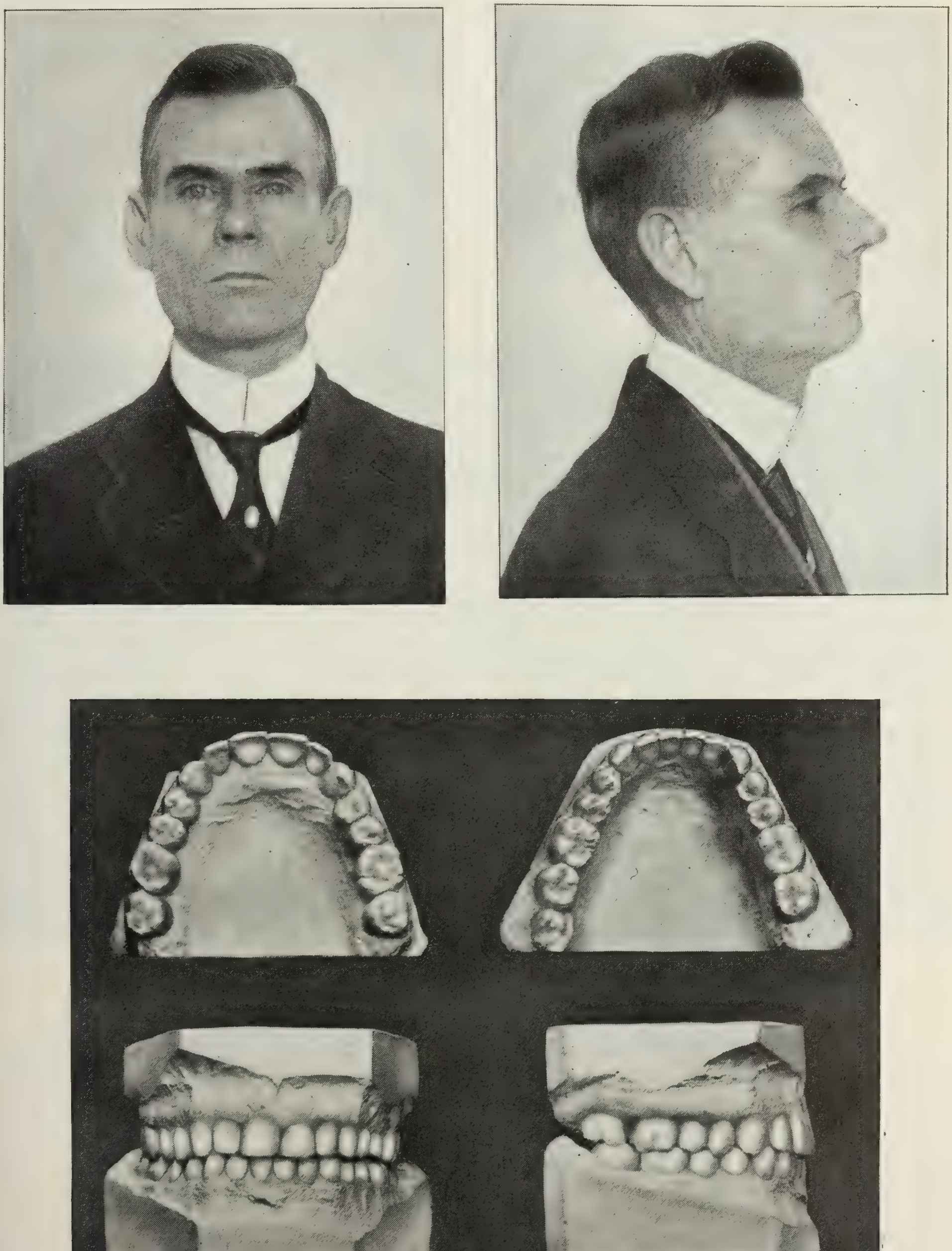
* Since writing this paper, the author has learned that the well-known artist, Mr. Clarence Underwood, has selected Miss Mason as a model representing the highest standard of American womanhood.

Fig. 2.



Showing the type submitted to various dental authorities, together with models of subject's teeth.

set of Trubyte teeth, selected by the writer's father, Dr. J. Leon Williams, to harmonize with the face of the individual and also a photograph of the individual. I would like to have you set up these teeth, shaping the arch as you think it should be to harmonize with the face of the person as shown in the photograph. Disregard, if you please, length of bite, fulness, and compensating curve, as all I wish to secure is an outline of the arch. If you are willing to co-operate with me in this undertaking, please sign the inclosed post-card, and return within two weeks.

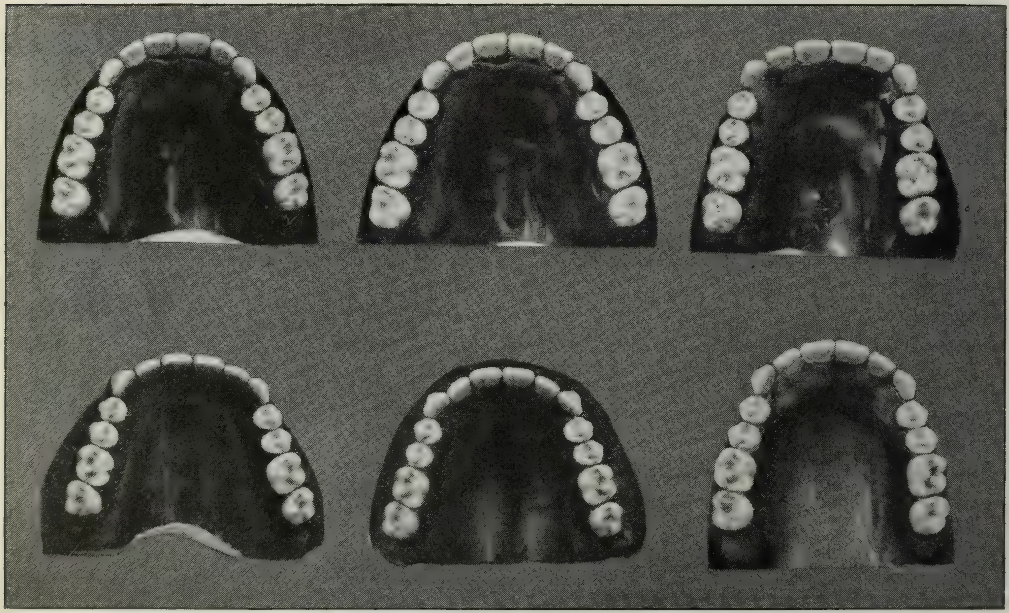
Several interesting and widely divergent opinions were expressed; some declining, saying it was impossible to determine the shape of an arch for a given type. Fig. 3 shows some arches received.

In a detailed analytical study of the mouth, we are concerned with the superficial structures, the orbicularis oris and less important muscles, and the underlying structures, alveoli, and teeth. The orbicularis muscles differ from other muscles in the arrangement of their fibers, and their ability to contract from all directions toward a given center—this special function of contraction plays a very prominent part in expression. The mouth, like the eye, which is also surrounded by an orbicularis muscle, is capable of great movement, and either in a state of extreme or partial contraction its size, fulness, and curves are largely dependent upon the structures immediately beneath it.

Quoting again from Vanderpoel, we read: "Beginning with the front view, we note first the convexity of the mass of the mouth as affected by the teeth. Irrespective of the view or action, first establish the relation of the corners to the middle; this is extremely important, as it involves symmetry both in construction and action, as well as expression." The size and shape of the mouth are largely dependent upon the widths of the six anterior teeth of the upper jaw and the curves described by them.

In the normal mouth the orbicularis oris muscle is in a slightly contracted state at all times, so that any change in

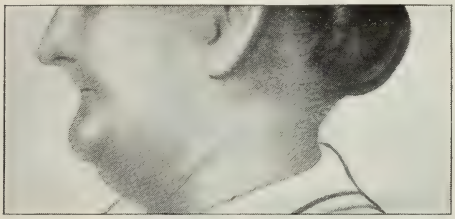
Fig. 3.



Showing teeth arranged by several dental authorities.

the underlying structure will sooner or later be followed by a similar change in the shape and size of the mouth. This is readily seen in persons wearing full dentures; when the plates are removed the muscle contracts, and the mouth becomes considerably smaller. (Fig. 4.)

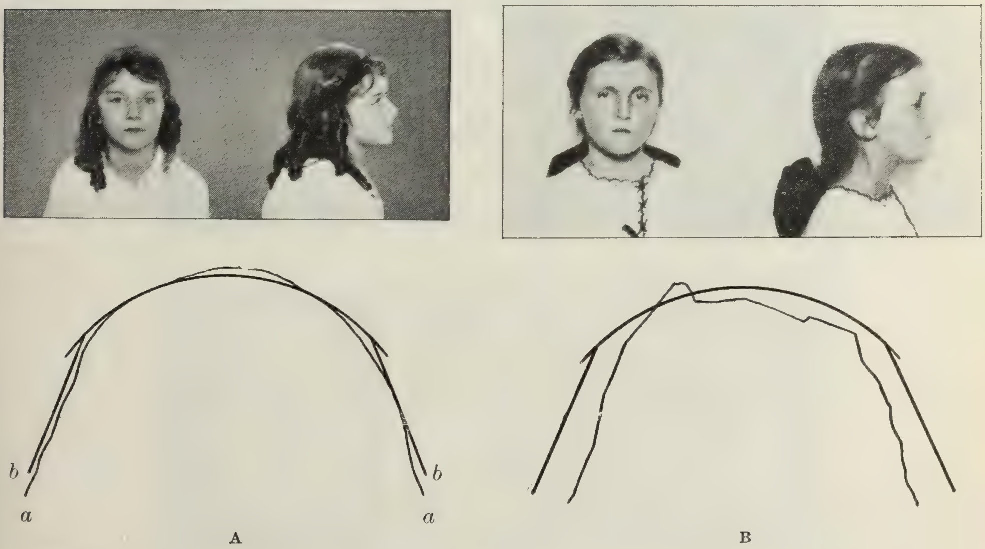
FIG. 4.



Showing contraction of obicularis muscle, due to underlying structures.

It is also seen in those individuals whose cuspid teeth have failed to erupt or are out of alignment. Because of this disturbance of the normal arrangement of the teeth, the mouth is deformed by being too small and out of harmony with the rest of the face. (Fig. 5.) These children are of the same age and the teeth of each are about the same size; one is of a child who has undergone orthodontic treatment (A). The outline of the teeth in A is shown by the line *a*, which nearly corresponds with the line *b*, the curve the teeth will occupy at maturity. The other (B) shows a case of marked arrested development and its effect upon the shape of the mouth. You will notice that the arrested development extends to and includes the first molars. The anterior teeth are arranged in the form of a circle. Several well-known authorities in art state that the front teeth are arranged in the arc of a circle. Using this as an hypothesis, I began an investigation to determine if the belief were founded upon fact. It seems to be generally understood within our own profession that the teeth are arranged in the form of a parabolic curve. Lischer so describes them, and Ottolengui also mentions this in a recent article in *Dental Items of Interest.* Frederick Stanton of New York says that each normal arch possesses a particular curve of its own, and varies with each individual. In the face of all this

FIG. 5.

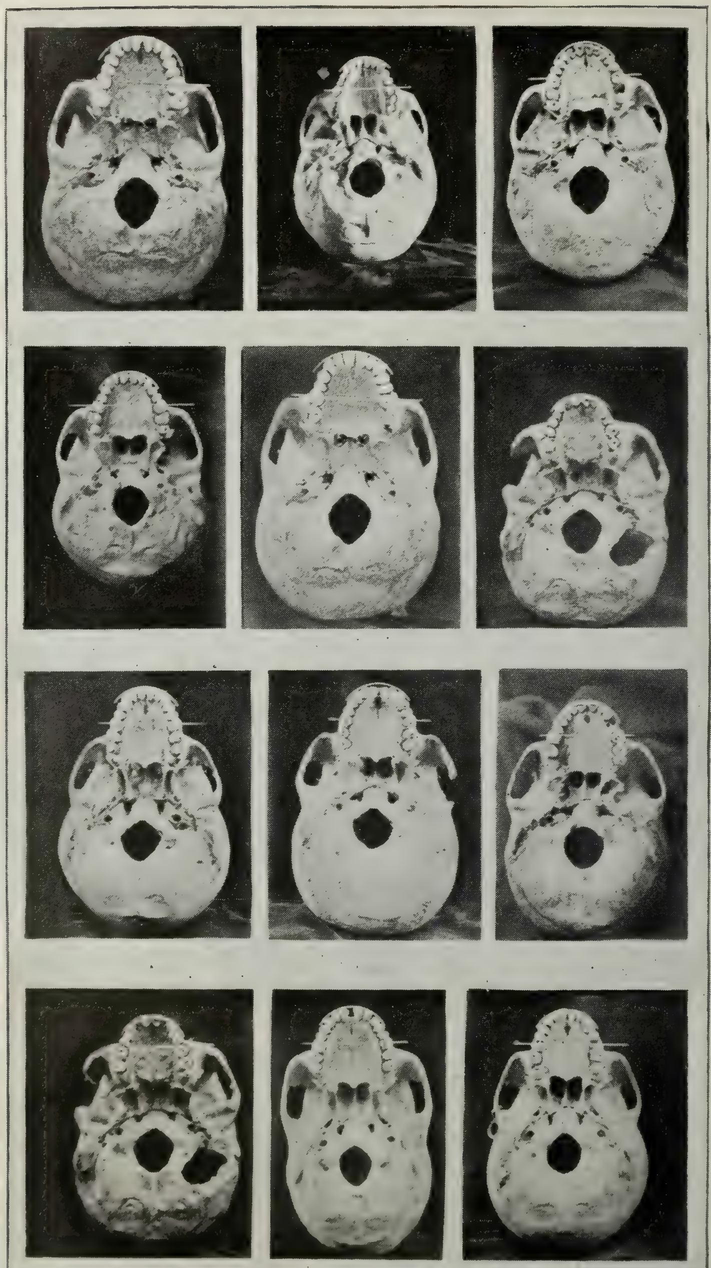


A

B

Showing a mouth with a normal arch and one with extreme arrested development.

Fig. 6.

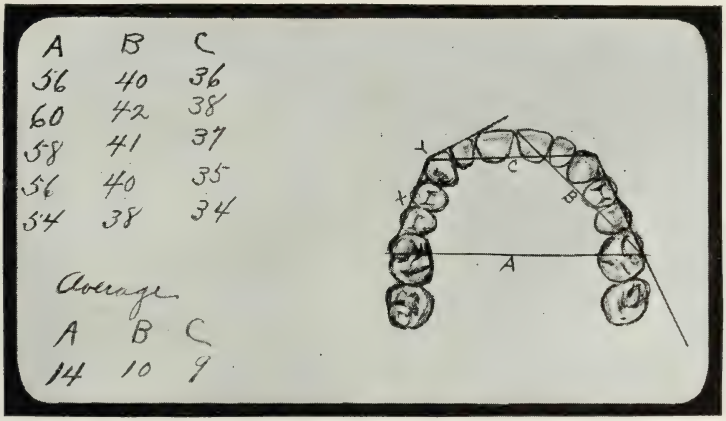


Showing front teeth arranged to the arc of a circle. (From photographs taken by Dr. J. Leon Williams from specimens in British Museum.)

it is interesting to note that the six anterior teeth are, at least in a great many cases, arranged in the form of a circle. (Fig. 6.)

A civil engineer recently said to the writer that a circle was the simplest curve for the front teeth to occupy, and that with so short a curve it would be difficult to arrange them either in the form of a parabolic or hyperbolic curve. Merely as a working hypothesis, we shall assume that the six front teeth are in the form of a circle, and pass on to analyze other parts of the normal jaw. I have mentioned the fact that the circle includes the six anterior teeth; in reality it begins at the center or cusp of the cuspid of one side, and extends to the cusp of the cuspid of the other side. The anterior part of the canine tooth takes the curve of the front teeth, while the posterior or distal portion takes the line of the bicuspids, which is not a curve but a straight line. (Fig. 7.)

Fig. 7.



A	B	C
56	40	36
60	42	38
58	41	37
56	40	35
54	38	34

Average

A	B	C
14	10	9

Showing angle at point of cuspid marked Y.

This of course makes an angle at the point of the cuspid. This has been observed and mentioned by Richard Hatton in his book called "Figure Drawing for Art Students." This straight line, which begins at the point of the cuspid, passes backward, touching the points of the bicuspids and emerging at the buccal groove of the first molar. This line, while it may appear arbitrary, does show in many normal arches, and plays a very prominent part, as I shall show later. We find that the second permanent molar does not fall on this line, but is considerably inside, touching a line drawn through the buccal cusps of the first molar.

COMPARISON OF MEASUREMENTS IN NORMAL ARCHES.

We shall now pass from this brief analysis, and inquire into some of the measurements which produce the above-mentioned arch. In an attempt to determine upon what parts of the arch I should make measurements, it occurred to me that it would be necessary to locate the center of the circle described by the front teeth. I took a photograph of a normal arch, located the median line, and moved the compass back and forth on this line until the other point would fall on the six anterior teeth; and invariably the center occupied a point between the molars. Acting for the time being on the assumption that the center of the entire arch might be at this point, I decided to take one measurement between the first molars, which I shall call A (Fig. 7). I also saw that the size of the circle in front was dependent upon the distance between the canines; that is, if the front teeth occupied the arc of a small circle, the cuspids would be nearer together than they would if the teeth were arranged in the arc of a large circle. I decided the distance between the points of the cuspids should be my next measurement, which I shall call C. These two measurements would indicate the width of the arch. The only measurement now necessary was to determine the length or depth from front to back along the median line. It is obvious that in a live subject, or on a model, it would be impossible to locate a fixed point at the back of the mouth, so this was overcome by measuring from the buccal groove of the first molar to the median line. This measurement I shall call B. This line B, being the hypothenuse of a right-angle triangle, answers every purpose for determining the depth of the arch, as once this line is known the length of the median line is easily determined.

The first set of measurements were taken from arches of live subjects, in all of whom the teeth were in normal occlusion. I might mention the fact that at the beginning of this work it was my intention to measure jaws in normal occlusion, excluding all others. I soon saw, however, that I was excluding some valuable material which might prove to be more interesting than cases of normal occlusion, all of which were natural arches, never having undergone orthodontic treatment. I was quite startled to find that the ratio of these three lines which I have already mentioned was practically uniform throughout the five cases. They were as follows:

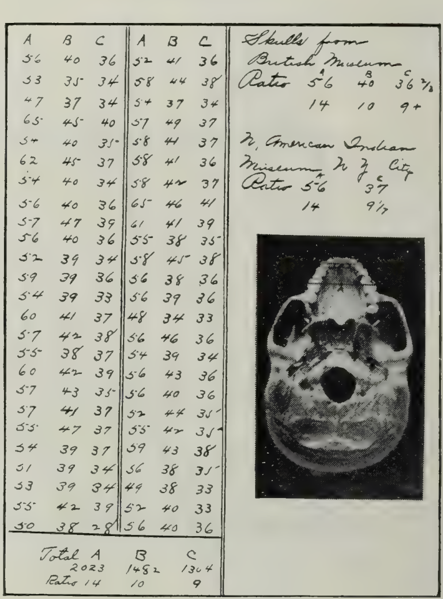
A	B	C
56	40	36
60	42	38
58	41	37
56	40	35
54	38	34

Taking the average of these measurements, and reducing them to the lowest ratio without fractions, we have

A	B	C
14	10	9

As all of these first cases were beautiful examples of occlusion, I concluded there must be something significant in these strikingly similar measurements, and at once determined to see if Nature were playing a trick, or if this were her method of constructing natural dentures. I thought at the time that living subjects were necessary, so I secured access to some manufacturing establishments, and began to systematically measure arches of employees. My first group, consisting of fifty-one individuals, is shown here with the average ratio. (Fig. 8.)

FIG. 8.



A	B	C	A	B	C
56	40	36	52	41	36
53	35	34	58	44	38
47	37	34	54	37	34
65	45	40	57	49	37
54	40	35	58	44	37
62	45	37	58	41	36
54	40	34	58	42	37
56	40	36	65	46	41
57	47	39	61	41	39
56	40	36	55	38	35
52	39	34	58	45	38
59	39	36	56	38	36
54	39	33	56	39	36
60	41	37	48	34	33
57	42	38	56	46	36
55	38	37	54	39	34
60	42	39	56	43	36
57	43	35	56	40	36
57	41	37	52	44	35
55	47	37	55	42	35
54	39	37	59	43	38
51	39	34	56	38	35
53	39	34	49	38	33
55	42	39	52	40	33
50	38	28	56	40	36

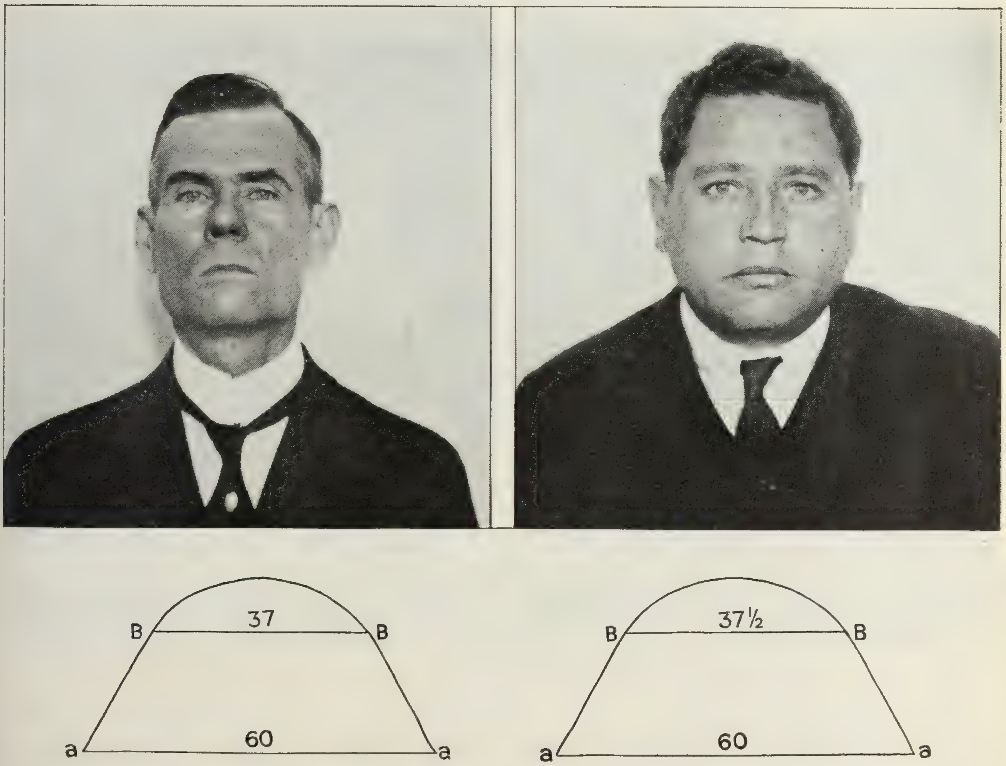
Total	A	B	C
	2023	1482	1304
Ratio	14	10	9

Skulls from British Museum
Ratio $\overset{A}{56}$ $\overset{B}{40}$ $\overset{C}{36\tfrac{2}{3}}$
14 10 9+

N. American Indian Museum N Y City
Ratio $\overset{A}{56}$ $\overset{C}{37}$
14 9½

I selected only those which were free from marked irregularity. Little attention was paid to any arches that were out of alignment or showed arrested development. I soon learned that the percentage of arches suitable for measuring would be very low, so I began to look elsewhere. I visited the Museum of Natural History in New York City, and made measurements of skulls of about fifty of the native North American Indians, many of which are over five hundred years old. While many teeth were missing in most of the skulls, fortunately I found quite a number with the molars and cuspids present. Because of the loss of the incisors, I am able to show only measurements A and C. You will be interested to know that while making these measurements at the museum I was very fortunate in meeting Dr. Clark Wissler, director of the department of anthropology. I laid what material I had before him, and expressed the opinion that there was not the variability of shapes in the arches that was generally believed. I wish to quote his exact words as he replied—for I was so impressed that I wrote them down at the time: "There is no anatomical part in mammals so uniform as dentition. Even between primitives and man there is a striking likeness in the shape of the jaw. Teeth make the arch, and the species' variability is so small in a racial type that it requires careful measuring to detect the difference in shape." (Fig. 9.)

Fig. 9.



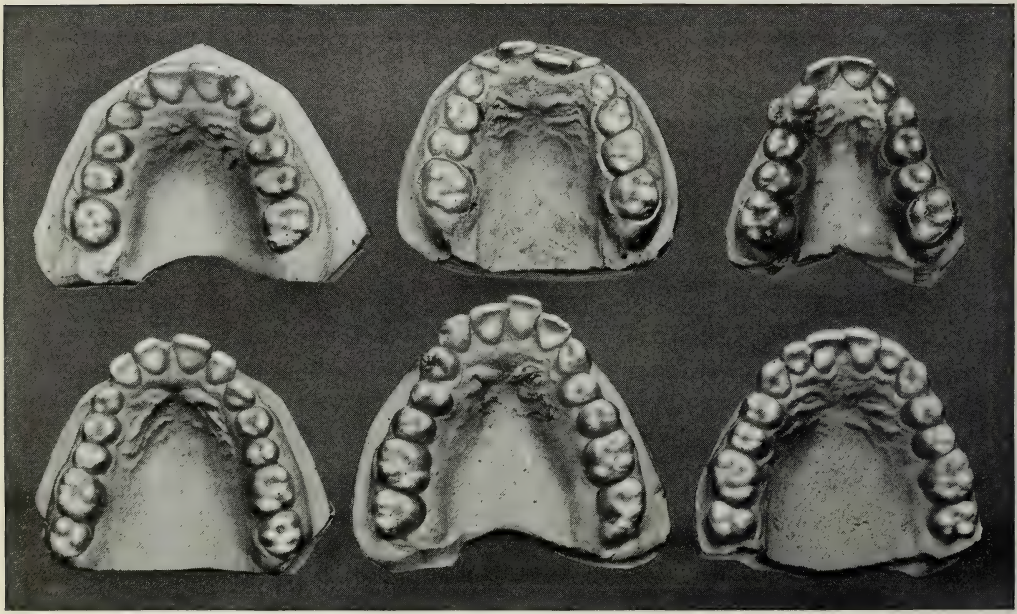
Showing two radically different types with approximately the same shaped arches.

SLIGHT VARIABILITY OF ARCHES WITHIN THE RACIAL TYPE.

In expressing my regrets to him that there was not more material available for work of this kind, I was delighted to learn from him that he had conducted an investigation some years ago, to determine if there were such a thing as a typical arch, or palate as he termed it, in feeble-minded children. This investigation resulted in an examination of two thousand feeble-minded children, and five hundred normal children, and was conducted by Dr. Walter Channing and Dr. Wissler. A number of dentists were employed, and impressions and models made of the mouths of the children already mentioned. Very careful and accurate measurements were made from these models, and analyzed, tabulated, and discussed in an article, a reprint of which Dr. Wissler placed in my hands. Unfortunately, only fifty models were measured on the outside of the molars; all others were measured inside. However, the models were carefully preserved in the museum, and I was at liberty to measure them. The results of measurements made up to the present time in no way differ from those I have already shown. About six hundred models measured show the same ratio I have already indicated. This confirms the statement made by Dr. Wissler, as well as the opinion which I have always held, that the amount of variability in the arch within a racial type is exceedingly small.

Since we have evidence that nature is maintaining a uniform ratio between the cuspids and first molars with marvelous accuracy, it is interesting to note that this same fourteen-to-nine ratio is seen in jaws showing a marked arrested development. (Fig. 10.) We see here some arches in which there is arrest of growth extending to the second molar. This arrested development in the molar and bicuspid region is confirmed by the valuable work now being done by Lawrence Baker of Boston. As you are probably aware, Dr. Baker's experiments prove that the lack of exercise of the function of mastication is largely responsible for the arrested growth on the side affected. There is no doubt in my mind that he has uncovered a most vital truth, and the value of it to the race cannot be overestimated. It is logical, then, to assume that in a case of malocclusion showing marked arrested development the positions of the first molars are of prime importance, especially as we have eruption of these teeth so far in advance of the cuspids. Before orthodontic treatment can be begun in a systematic manner, it is imperative that we first determine whether or not the positions of the first molars are correct, especially bucco-lingually. E. A. Bogue, in the November 1916 *Dental Digest,* has called attention to the importance of

Fig. 10.



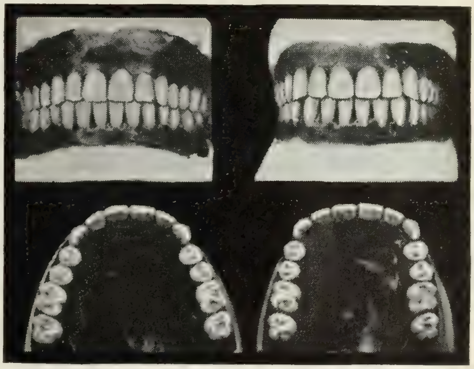
Arches with marked arrested development, with a 14 : 9 ratio.

recognizing the position of the first molars soon after their eruption, and insists that the distance between them should be great enough to prevent the crowding of the anterior teeth. I regret that time will not permit me to exhibit more models of arrested development, showing with what accuracy nature maintains this ratio. The freedom with which some orthodontists, especially those using the so-called Jackson system, disregard the position of the molars and expand in the cuspid region, is sure to bring unhappy results. I regret that this practice is indulged in so universally. Nothing to my mind could be so detrimental to the welfare of the teeth as to insert a Jackson appliance with wire clasps passing around the first molars, retaining the molars in the same position for a period of four or five years, and preventing even the natural growth which would probably take place to at least a limited extent were the appliances not holding them back. In using the Jackson system with the assumption that the molars are in the correct position bucco-lingually, the only possible way to increase the space is by producing great expansion in the cuspid region. This frequently means the creating of a circle for the anterior teeth which is entirely too large, thus producing an arch that is out of harmony with the rest of the face.

I was recently asked for advice by a patient who had been in the hands of an orthodontist of international reputation. She had been wearing Jackson appliances for three years; her teeth were regular, but she has a badly deformed arch. The circle of the front teeth was so large that when she attempted to laugh her lip was so badly stretched that she immediately became conscious of her trouble, and suppressed the action. She said her mouth seemed to be very much larger and her teeth more conspicuous than before the work was begun. I made careful measurements of her arch, and found the ratio between the cuspids and molars to be 52 : 39 or 14 : 10¾. Of course, the distance between the molars was not great enough, and by confining the expansion to the anterior part of the mouth, a large circle, with the unpleasant results, followed. Instead of the center of the circle of the front teeth being between the molars, it fell somewhere in the region of the foramen magnum. I feel so much the importance of demonstrating the bad effects of this incorrect procedure that I have arranged a set of artificial teeth which conform to the measurements of this young lady's arch. (Fig. 11.)

Compare the position of the cuspids with those of the other picture. You will also notice the size of the circle from the front, giving the appearance that the teeth are much too large for the face. In cases of class II, with extreme upper protrusion, the ease with which the front teeth drop back when expansion is begun in the molar region confirms my belief that the correct position of the molars is an important principle in retention. But to disregard the position of the molars, or to assume, as Jackson says, that in 85 per cent. of cases needing orthodontic treatment the molars are in correct position bucco-lingually, and then proceed to create an arch which so directly violates nature's laws, brings us face to face with failure; for an arch

FIG. 11.



On the right an arch regulated by Jackson system; circle much too large. On the left is shown the author's conception of correct arrangement.

which is not natural in shape, like the house upon the sands, though it may stand for many years, when the storm comes will collapse and fall to pieces.

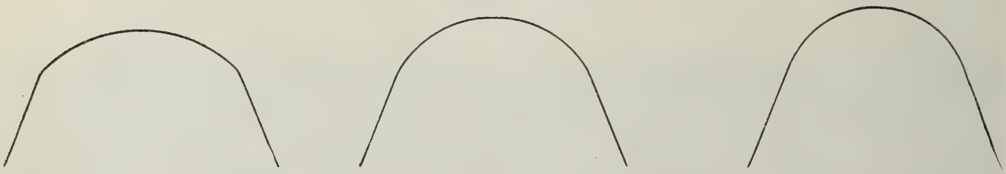
SUMMARY.

The shape and size of the mouth are determined by the underlying structures, chiefly the six anterior teeth.

Arches vary slightly to harmonize with different racial types, but the variability within a racial type is extremely small. Environment has produced a distinct American type. In the arch of this type nature has maintained with marvelous accuracy a uniform ratio between the molar and cuspid lines. Therefore in a constricted narrow upper jaw, if the ratio between the molar line and the cuspid line is 14:9, no expansion can take place between the cuspids without a corresponding amount of expansion between the molars. In other words, the ratio must be carefully maintained in order to have a normally shaped arch.

The front teeth are arranged in the arc of a circle. As a working hypothesis, the center of this circle is midway between the buccal grooves of the first molars. The radius of this circle is determined by the combined mesio-distal diameters of the permanent teeth from the buccal groove of one first molar to the buccal groove of the other. As the arch is narrowed, this center moves forward along the median line, producing a smaller arc for the front teeth, and allowing variations, as shown in Fig. 12.

FIG. 12.



Arches showing normal variations, 14 : 9 ratio maintained.

Many arches are badly deformed because of a lack of knowledge of fundamentals and correct technique.

Arches that are not natural in shape can never be retained.

8 WEST 40TH ST.

Novocain Conductive Anesthesia in Exodontia.

By L. BIDDLE DUFFIELD, D.D.S., Philadelphia, Pa.*

(Read before the Academy of Stomatology of Philadelphia, at its regular monthly meeting, March 27, 1917.)

THE advantages of nitrous oxid and oxygen anesthesia in the routine practice of the exodontist, after having been tested for decades, needs no special accentuation. In certain specialties of dentistry, however, notably the operative branch, in which efforts have been made to combat pain by the application of N_2O and O analgesia, a reverse of the tide has been experienced, and a great many practitioners have been inclined to disparage the value of N_2O and O anesthesia. It may not be amiss once more to emphasize the fact that a successful, safe, and expedient exodontic practice could hardly be carried out successfully without the benefits afforded by this technique. Anyone familiar with the daily application and administration of this form of anesthesia knows that there is no safer, more convenient, and practical general anesthetic available.

NITROUS OXID AND OXYGEN ANESTHESIA IN EXODONTIA, AND ITS INDICATIONS.

In the routine extraction the patient is ushered to the chair, given the benevolent influence of this remarkably safe anesthetic from the hands of a skilled anesthetist, and the no longer useful, or even obnoxious, unit of the denture is eradicated while the patient is enjoying the not unpleasant experience of an artificially induced sleep.

Patients of highly excitable, neurotic temperament especially appreciate this means of being relieved of the combat against one of the primeval instincts—fear. To them, N_2O and O anesthesia appears as a blessing that relieves them from any extraordinary effort of will power or the extremely untoward results of mental and surgical shock. The consequences of such shock may assume very serious proportions. It is the highest and the lowest types of patients who regard the artificial induction of sleep, or *nirvana,* as a most blissful means of passing through a surgical experience—that is, an extraction—which by the overwhelming majority of laymen is still looked upon as one of the most disagreeable experiences and one of the most regrettable manifestations of the weaknesses to which human flesh is heir. Since the after-effects of this form of anesthesia are not disagreeable, if the anesthesia has been induced by a specially trained anesthetist; since, with one of the highly developed modern types of machine, the most minute details of the administration can be scientifically adapted to the special needs of the case in hand, and since the margin of safety is indeed so wide as to practically eliminate the risk of fatality if the diagnostic premises have been properly adjudged by the operator, N_2O and O anesthesia may be safely said to be an indispensable factor in the exodontist's routine practice.

While we acknowledge all the wonderful benefits accruing from this anesthesia, we would be remiss in our duty toward the patient were we to proclaim N_2O and O anesthesia in exodontic practice as a one hundred per cent. method suitable in every case.

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* The writer wishes to make grateful acknowledgment to Dr. R. H. Riethmüller of New York City for advice and assistance in the preparation of this paper.

CONTRA-INDICATIONS TO N_2O AND O ANESTHESIA.

It has repeatedly been acknowledged by men of the widest experience in its administration that this method, in certain cases, entails certain difficulties, and indeed contra-indications, which militate against its routine application in every case. Men familiar with it are not over-enthusiastic about experiences with patients of alcoholic or drug habits, with cardiacs, diabetics, arterio-sclerotics, nephritics, and the tuberculous. In the conscientious operator's mind there looms always the fear that there may be present in a patient who is in apparently perfect health, with normal pulse and respiration, a hidden aneurysm, which, under the inevitable rise of blood pressure accompanying N_2O and O anesthesia, may give way and terminate the life of a patient who is doomed anyway, sooner or later, under circumstances apparently incriminating the operator's judgment.

Upon the other hand, it is the natural ambition of every exodontist, whose aim it is not only to "get the tooth out," but to perform a clean surgical operation, to apply his surgical skill in such a manner that the patient's interests will be best served, and that the operative dentist, the crown and bridge worker, and especially the prosthodontist, have their patients return to them exhibiting a condition of the mouth favorable—in fact, ideal under the circumstances—for proper restorative measures.

There are a great many cases in which the exodontist would have to prolong the N_2O and O anesthesia to such an extent as to invite consequences detrimental to the patient's systemic health. Crile has convincingly demonstrated that prolonged surgical general anesthesia entails the destruction of a certain number of cells of the brain, of the adrenals, and of the liver, and the conscientious anesthetist should employ every means to counteract the risk of shock, by the selection of the anesthetic most suitable to the patient's social, mental, and physical status. There are patients to whom the idea of being put to sleep by artificial means is equivalent to the risking of life; others would suffer for an inordinate length of time from post-operative nausea and shock; others, again, present conditions requiring surgical intervention of prolonged duration of such a nature as to render the application of a general anesthetic impracticable and contrary to the best surgical judgment. It is in these cases that the patient's interest and the operator's efficiency are best served by the application of conductive anesthesia

ADVANTAGES OF CONDUCTIVE ANESTHESIA.

It is not necessary here to mention specially the axiom that in both general and local anesthesia the principle of asepsis demands most vigorous observation. The administration of pure gases through sterile tubing and sterile nose- or mouthpieces is no less essential than the injection of a sterile novocain solution by means of sterile instruments. It is in this respect that the majority of sins are committed by some operators against both general and local anesthesia. For the exodontist the practice of asepsis is indispensable to success—a religion, an article of faith, we might say, whose principles must be scrupulously observed, especially in view of the dire results which follow neglect of these principles, or the unjust accusations made against either method by men who are prone to ascribe their failures to one or the other of the methods, or both, instead of to their own shortcomings.

That which appeals to the up-to-date exodontist in conductive anesthesia is—

First: The simplicity of the technique of injection which is patent to anyone familiar with the anatomic premises upon which it is based, and which naturally are primary conditions for its successful application surgically.

Second: The toxicity of novocain-suprarenin solution, if injected slowly, is so low as to produce appreciable manifestations in the most exceptional cases only, and then usually exclusively in so-called "bad risks" where a general anesthetic would be *a priori* out of the question. Moreover, any of these toxic symptoms, if they do appear in the form of a slight pallor, perspiration, tremor of the extremities, or malaise, are of such a mild nature and of such unalarming proportions, provided the proper dosage and technique have been applied, that the operator may combat or rather observe these manifestations during their duration of a few minutes, and then proceed to his surgical task with the comforting assurance that there will be no further unlooked-for complications; and, if he has once tested the presence of the profound anesthesia aimed at, he can, without distraction, devote his full attention to the surgical requirements of the case.

Third: The quality and duration of the anesthesia obtained are such that the most complicated and extensive surgical operations can be performed without the patient's experiencing any pain whatever, and with the certainty that the first acute post-operative pains will be relieved by the anesthesia which persists for an hour or two following operation.

Fourth: The admixture of minute quantities of synthetic suprarenin to the anesthetic solution insures an entirely or fairly bloodless field of operation, which again is a factor making for greater surgical efficiency on the part of the operator.

Fifth: There is no danger of the patient swallowing blood or fragments of tissue, and any change in position which may be helpful to the operator can be readily executed by the patient himself, as he is not deprived of any of his mental or motor faculties except the sensory perceptions within the blocked area.

Sixth: The patient leaves the operating chair without the necessity of resting, or of ministrations toward resuscitation, and can be given full and clear instructions as to post-operative treatment by which he may himself hasten the healing process or render it uneventful.

METHODS OF INJECTION.

The methods of injection practiced by the essayist are those pointed out by Professor Heinrich Braun, and applied and rendered accessible to the American practitioner in the text-book on "Local Anesthesia in Dentistry," by Fischer and Riethmüller.* The solution preferred by the essayist in the average case is the 2 per cent. novocain-suprarenin solution which contains the admixture of 0.00005 L-synthetic suprarenin. In cases of systemic complication, in patients of extremely young or old age, both these percentages are reduced by the admixture of additional quantities of Ringer solution. The standard solution, however, employed in our practice is obtained by dissolving one E tablet in 1 cc. of the Ringer solution.

Maxillary injections. It may not be amiss to briefly refer to the method of injection employed by the essayist for anesthetizing upper molars. The needle of 42 mm. length, in the long hub, is inserted in the *reflection* of mucous membrane which is previously sterilized, and anesthetized by the iodin-menthol-benzol solution suggested by Riethmüller,† between the first and second molars, or we may say posteriorly to the disto-buccal root of the first molar, advancing along the bone at an angle of from 45 to 60 degrees to the median axis of the body, to the cribriform plate, where 2 cc., or the full contents of the syringe are deposited, blocking the posterior superior alveolar branch of the fifth cranial nerve. This is usually known as the tuberosity injection.

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* "Local Anesthesia in Dentistry, with Special Reference to the Mucous and Conductive Methods." By Prof. Dr. Guido Fischer. Second American from the third German edition, thoroughly revised, with additions, by Richard H. Riethmüller, Ph.D., D.D.S. Philadelphia and New York: Lea & Febiger, 1914.

† "Further Researches in Novocain-suprarenin Anesthesia." By Richard H. Riethmüller, Ph.D., D.D.S. "American Year-book of Anesthesia and Analgesia." Surgery Publishing Co., New York, 1915, pp. 307, 308.

For the anesthetization of the soft tissues palatally, the injection of a few drops of the anesthetic by way of infiltration is made in the vicinity of the posterior palatine foramen, depriving of sensation the soft tissues up to and including the first bicuspid.

In anesthetizing bicuspids, practically the same technique is followed as in the case of the upper molars, with the difference that two-thirds of the contents of the syringe are deposited at the cribriform plate, and the remainder of the contents of the syringe—that is, one-third of the solution—is deposited as the needle is withdrawn. This leaves a deposit of anesthetic solution extending from the cribriform plate to the middle superior dental foramen, and results in perfect anesthesia of the bicuspids in about 75 per cent. of cases.

If the middle division of the nerve does not appear upon the facial surface of the bone, but runs its course in the mucous lining of the maxillary sinus, the solution seems to find its way through the canaliculi in the *cortical* layer of the bone, and results in bicuspid anesthetization. If the middle superior division—as seems to be the case in some 25 per cent. of cases—is either not present or is combined with the anterior superior dental division, it is blocked by way of the infra-orbital foramen, which is reached by the needle being inserted to about two-thirds of its length in the reflection of mucous membrane over the apical root-end of the first bicuspid, advancing in the direction of the first bicuspid, and depositing two-thirds of the contents of the syringe—that is, 1½ cc.—in the areolar or soft fatty and connective tissue overlying the infra-orbital foramen. Infra-orbital injections invariably anesthetize the three anterior teeth—central, lateral, cuspid—and, evidently by way of anastomosis, the first bicuspid also.

Instead of making an injection in the vicinity of the naso-palatine foramen, which is painful, an infiltration of a few drops back of the lateral incisor will successfully anesthetize the soft palatine tissues connected with the anterior teeth.

Mandibular injections. In the lower jaw the technique of injection is extremely simple, owing to the very simple distribution of the mandibular nerve, which enters the mandibular canal at the foramen, after having given off the lingual nerve for the innervation of the soft tissues connected with the lower teeth lingually, and the anterior two-thirds of the tongue.

The anatomic landmarks are determined by the operator inserting the palpating finger-tip of the left hand in the post-molar triangle formed more or less distinctly by the external and internal oblique lines of the ascending ramus. The needle is inserted at the point indicated by the middle of the nail of the palpating finger, the syringe barrel resting upon the masticating surface of the bicuspid teeth of the opposite side. After the needle is inserted half its length, a few drops are discharged to anesthetize the lingual branch of the nerve. The needle is then inserted to its full length, and the contents of the syringe—that is, a little less than 2 cc.—are deposited in the areolar tissue overlying the mandibular foramen, whence the anesthetic is conducted by the mandibular nerve to the median line and across to about the first bicuspid region of the opposite side. If anterior teeth are to be extracted, the anastomosis is blocked by injection at the mental foramen of the opposite side, the needle being inserted between the first and second bicuspids to about a quarter to a third of its length, and about ½ cc. of solution being deposited in the areolar tissue covering the foramen.

The length of time for the establishment of full anesthesia varies from three to five minutes in tuberosity, infra-orbital, and mental injections, and from five to ten minutes in mandibular injections. It must, of course, be understood that all these injections are of a perineural nature—that is, in all injections the solution is deposited in the vicinity of nerve trunks, not directly into them;

and the needle is advanced very slowly, so that arteries and veins have ample time to escape uninjured from the advancing needle, into soft fatty and connective tissue, so that no edema or paralysis from puncture of these organs can occur. The more slowly the solution is deposited, the less likelihood there is of any toxic symptoms occurring, and the more rapidly will full anesthesia be established, provided the necessary precautions of asepsis—of solution, instrumentarium, and field of injection—as pointed out above, have been observed.

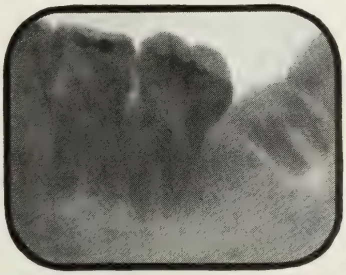
It goes without saying that conductive anesthesia cannot be compared in any way with the old-fashioned and unscientific methods of infiltration. Infiltration in the peridental tissues invariably involves the risk of infection; infiltration of the facial mucosa is painful, slow, and productive of damage to the soft tissues, resulting in after-pain and sloughing. Moreover, there is ever present the danger of forcing septic matter from a focus of infection to deeper strata and into the blood stream, with the subsequent untoward local and systemic sequelæ resulting therefrom, which are sometimes erroneously attributed to the toxicity of the anesthetic solution. Any injection into an infected area should be carefully avoided, and unless sound tissue can be found in which to make the conductive injection this method is contra-indicated, and general anesthesia must be resorted to. This again emphasizes the necessity of the dentist's being fully equipped and familiar with both general and local methods of anesthesia.

INDICATIONS FOR CONDUCTIVE ANESTHESIA.

In the essayist's experience, the following classes of cases are more expeditiously handled under conductive than under general anesthesia, always provided of course that the condition of the tissues permits of safe injection.

(1) *Extraction of difficult teeth which have baffled the general practitioner's attempts.* Frequently the exodontist is called upon to extract difficult teeth upon which futile attempts at extraction have previously been made, usually under general anesthesia. These cases ordinarily present mutilation of the tooth in question and of the tissues surrounding it, complicating the specialist's efforts. There is usually a considerable amount of pain present, and an aversion on the patient's part to submit to another general anesthesia. A correctly made local injection in such cases gives almost immediate relief from the pain that has often deprived the timid patient of several nights' rest. Under conductive anesthesia the fragment can be exposed with a minimum amount of hemorrhage, and if necessary a portion of alveolar bone can be chiseled away without undue inconvenience to the patient, the refractory offender removed, and suitable post-operative measures instituted.

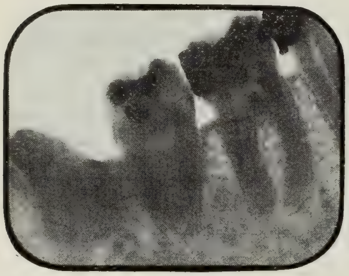
FIG. 1.



Mrs. H., thirty-three years of age, had been given N_2O and O anesthesia three times by a specialist for the extraction of a lower left third molar. After radiographic diagnosis, one mandibular injection of a 2 per cent. novocain-suprarenin solution was made, resulting in perfect anesthesia and painless removal of the fractured tooth. (See Fig. 1.)

Mrs. M., thirty-five years of age, had undergone three previous attempts at extraction of a third molar under N_2O and O anesthesia, following which partial ankylosis had set in and persisted for three months. After having been treated unsuccessfully by a physician for this period of time, the case was referred to the writer. The mouth was gently forced open sufficiently wide to permit the injection of 2 cc. of a 2 per cent. novocain-suprarenin solution. The mouth was then opened widely, and the fractured tooth removed. Post-operative treatment was given for three days, when all ankylosis disappeared and normal opening and closing of the mouth was re-established. (See Fig. 2.)

Fig. 2.



(2) *Impacted third molars.* In cases of impacted third molars, both upper and lower, conductive anesthesia offers special advantages to the patient and the operator. No prolonged general anesthesia is necessary, and the operator can apply the full measure of his skill to the removal of the anomalous member. The most significant advantage is that the second molar, so essential to masticating efficiency, need not be sacrificed. The loss of a third molar, especially if impacted, may be and usually is a real blessing to the patient, as its retention is sometimes productive of a syndrome of local and systemic affections to an incredibly large extent. On the other hand, the unnecessary sacrifice of the second molar is inexcusable in the light of our present knowledge of the importance of dental units and considering the availability of methods which positively guarantee the preservation of the second molar. If the impaction is of such a nature as to require the removal of a portion of the alveolar bone or of the ascending ramus, this can be done painlessly, and with the certain assurance that the bone sacrificed will be rapidly regenerated. It is surprising, indeed, with what facility, comparatively speaking, these impacted third molars, which may be present in every variety of shape and position, can be removed under this method; how little post-operative pain is caused to the patient; how rapidly normal healing occurs, and how quickly normal conditions are re-established under proper post-operative care.

Fig. 3.

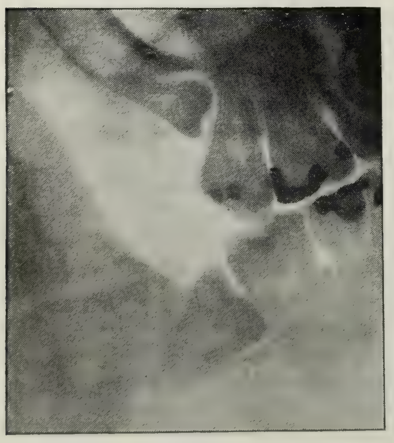
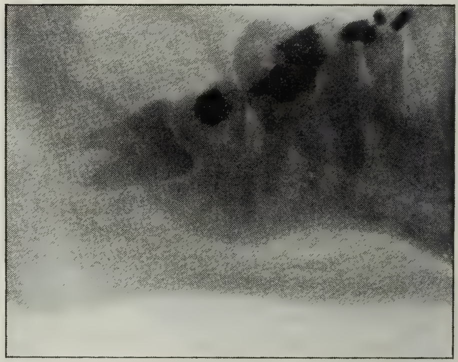


Fig. 4.

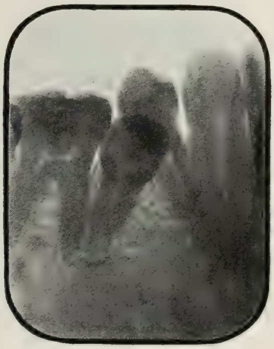


Miss H., twenty years of age, presented with two impacted third molars, right upper and lower. Injection was made of 2 cc. of 2 per cent. novocain-suprarenin solution in the tuberosity region on the upper right side, also 2 cc. at the mandibular foramen on the lower right side. Both teeth were removed with no pain whatever to the patient. The duration of the entire operation was about thirty-five minutes. (See Fig. 3.)

Mr. M., twenty-one years of age, had an impacted lower right third molar removed under mandibular anesthesia. The operation, which was painless, required fifty minutes. (See Fig. 4.)

(3) *Malposed teeth.* Malposed teeth present special difficulties, owing to the operator's natural desire to save the sound teeth in the vicinity of such anomalous members. As conductive anesthesia permits a carefulness and delicacy of technique which could hardly be promised under a general anesthetic, the advantages to both patient and operator are self-evident.

Fig. 5.



Mr. S., eighteen years of age, showed a lingually inclined lower left second bicuspid in malposition. Injection was made of 1½ cc. of novocain-suprarenin solution at the mental foramen, and a few drops were infiltrated lingually mesially to the root. The extraction of the tooth required about one minute. (See Fig. 5.)

(4) *Teeth in dangerous proximity to the maxillary sinus.* The risk of forcing a tooth or a part thereof, when in anomalous relationship to the maxillary sinus, into the sinus itself, resulting in the opening of the antrum, so justly dreaded by most practitioners, can be successfully overcome under conductive anesthesia, owing to the fact that the operator is enabled to proceed with his operation delicately and without undue haste.

Mrs. F., fifty years of age, presented an impacted and unerupted upper left third molar with roots penetrating the antrum. Following a tuberosity injection of 2 cc. novocain-suprarenin solution and infiltration of a few drops at the posterior palatine foramen, the tooth was removed without any inconvenience to the patient, within twenty minutes. (See Fig. 6.)

Fig. 6.

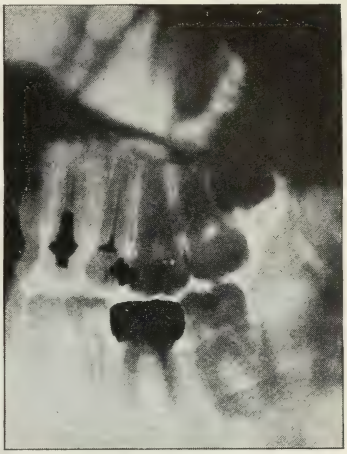
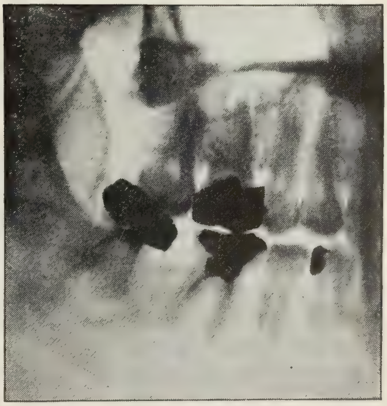


Fig. 7.

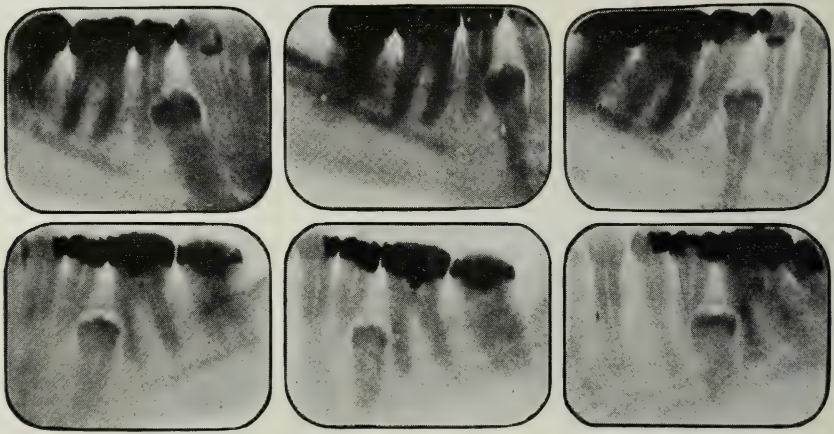


Mrs. C., thirty-three years of age, showed an impacted upper right third molar with roots penetrating the antrum and lying at right angles to, and over, the upper second molar. She gave a history of severe neuralgia in the maxillary region which had persisted for several months. Following the usual tuberosity injection and infiltration palatally, the tooth was removed buccally over the root of the second molar, which was left undisturbed. At the same sitting the upper first molar, which showed a large abscess at the root apex, also the lower right third molar, which presented a similar condition, were removed, the latter after the usual mandibular injection. At the same time the alveoli were thoroughly curetted, the entire operation requiring twenty minutes. The patient made an uneventful recovery in four days, with no recurrence of the neuralgia. (See Fig. 7.)

(5) *Supernumerary teeth.* These can be successfully exposed and removed without undue laceration of the tissues or endangering the vitality of adjoining teeth. The same may be said of odontomas or cysts of any character or extent. The healing of the wounds caused by surgical intervention, with the regeneration of bone tissue, is indeed remarkable, and attests the observation that the vitality and recuperation of teeth and of hard and soft tissues are in no way interfered with by conductive anesthesia.

Mrs. J. presented with impacted supernumerary bicuspids on each side of the mandible. Mental injections of 1½ cc. of 2 per cent. novocain-suprarenin solution were made on both sides, supplemented by infiltrations of a few drops mesially and distally of the roots. The entire operation required one hour. The patient experienced no pain, although she had previously suffered from nervous shock. (See Fig. 8.)

FIG. 8.



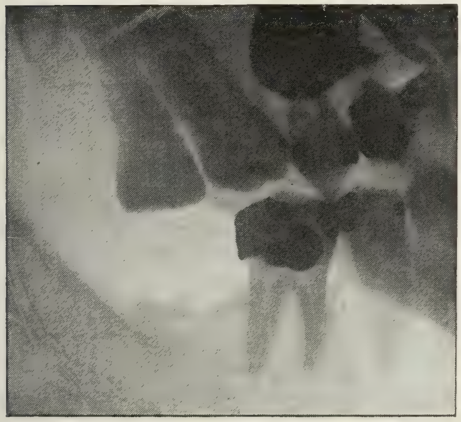
(6) *Foreign bodies.* The search for foreign bodies, small roots, fragments or sequestra of bone, under a general anesthetic, is indeed a difficult task that would try the skill of the most competent operator, since the field of operation is continually flooded and rendered obscure by the flow of blood. The comparative anemia provided by conductive anesthesia greatly facilitates such a task, and results in the location and removal of these fragments with the least amount of surgical traumatism.

The radiograph showed the remains of the distal root of a lower left second molar, left from someone's former attempt at extraction under N_2O and O anesthesia, and covered from view by gum tissue. After mandibular injection and infiltration of a few drops in the soft tissues buccally of the root, to eliminate sensation supplied by the long buccal nerve, an exploratory incision was made, and the root removed with an elevator. (See Fig. 9.)

(7) *Root amputation.* The amputation of infected roots may be said to

have become routine practice only since the advent of conductive anesthesia. Needless to say, in this operation all the advantages of this method apply most evidently, and the men who are making a specialty of this surgical procedure in saving teeth would hardly be able to attain such phenomenally favorable results without it. The eradication of the focus of infection is absolute, the restoration of bone is surprisingly rapid and complete, and the continued usefulness of the amputated tooth is insured.

FIG. 9.



(8) *Minor surgical interventions.* In all cases of minor surgery which come within the scope of the exodontist's work, such as curetments of necrosed bone, eradication of hypertrophic gum tissue, removal of so-called benign tumors, such as epulids, etc., conductive anesthesia has proved of inestimable value. No matter whether the curet, the bone forceps, the scalpel, or the actual cautery be employed, a radical and efficient operation is insured.

(9) *Fractures.* In setting fractures, provided the ankylosis is not so pronounced as to render the insertion of the syringe in the mouth impossible, or in exarticulations of the lower jaw, conductive anesthesia enables the practitioner to set or approximate fragments into correct anatomical position. It also enables the operator to insert painlessly any of the various splints advocated, with the greatest possible assurance that immobilization will be secured and that the expected functional result will be satisfactory.

CONCLUSION.

The comparative advantages of N_2O and O anesthesia and conductive anesthesia by means of novocain-suprarenin are being more and more correctly recognized and appreciated, and it may be safely said that the respective indications for either one or the other of these methods are fairly well understood. A blind adherence to either method is surely not to the best interest of the exodontist or the patient, and the intelligent co-operation between the general practitioner and the exodontist in regard to the selection of the anesthetic is extremely desirable, since it must always be our aim to serve the best interests of our patients, and to make accessible to them the methods of combating pain most suitable to the individual case and most certain to guarantee the best results.

1516 LOCUST ST.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

The Therapy of Radicular and Follicular Dental Cysts.

By RUDOLF WEISER, Vienna, Austria.

(Report to Section VII, Sixth International Dental Congress, London, 1914.)

HOWEVER alluring it might be to review the old and astonishingly rich literature upon dental cysts in relation to the historical development of the treatment of this interesting disease, this pleasure must be foregone, because the draconic laws of this congress and the outline of my report—closely adhering to these laws—force me to limit my exposition solely to the present methods of treatment.

The method of incising the cyst has rightly been abandoned. Indeed, it is nothing other than a technical error. Not only is it useless, but it leads, as these cysts appear so frequently in association with abscesses, to infection, with all its consequences, of the usually aseptic cystic contents. Also the extraction of the offending tooth is, perhaps with the sole exception of very small cysts, without result, since cysts may continue to develop independently after extraction. Likewise puncture, recommended for decades, with or without subsequent injection, accomplishes no result.

When we follow the classic descriptions of Perthes in his text-book(¹), which is such a treasury of valuable knowledge upon the pathology, pathogenesis, and therapy of dental cysts, we find that the present methods of treatment are championed by two groups of practitioners sharply separated according to their underlying standpoints.

While Magitot stood for incision and subsequent drainage, the younger French authors, Albaran, Heydenreich, and Jacques, emphasize the necessity for the complete extirpation of the cyst. These writers and their followers believed themselves forced to this hyper-radical procedure in order to eliminate the danger of recurrence of the cyst, as it presumably could reappear either as a unilocular or a multilocular cyst, if the operative treatment did not include thorough extirpation of the cystic wall. However, many hundreds of cases which have been treated by the method presently to be described prove how correctly Perthes judged the state of affairs when he said, "The few cases of return, upon which Albaran's contention is supported, are more plausibly explained on the assumption (1) that the cyst was not opened widely enough and had reclosed before its size had sufficiently diminished, or (2) when the recurrent cyst appeared as a multilocular cystoma there had been from the beginning a multilocular cyst, and the diagnosis of a one-chambered radicular cyst had been incorrect. At all events, up to the present time there has been no return of radicular cysts after Partsch's operation."

DISADVANTAGES OF THE COMPLETE EXTIRPATION METHOD.

The operation of complete extirpation of dental cysts has several disadvantages:

(*a*) Great difficulty attends its performance in cases of maxillary or mandibular cysts located far back in the mouth, or in cases where the cyst extends very far distally.

(*b*) In cases of displacement of the maxillary sinus or in other cases where the cyst has reduced the alveolar process of the front or back teeth to a thin wall, sufficient only to afford passage for the bloodvessels and nerves, the removal of the cystic wall may easily occasion undesirable wounds and injuries to the neighboring structures.

(*c*) Since healing is dependent upon the formation of granulations, the course of the wound—in contrast to that in other methods (Dupuytren, Heath, Partsch, Mosetig von Moorhof, Witzel, Neumann, Schroeder, Williger)— is unnecessarily prolonged, and becomes a burden to both patient and surgeon.

The method most generally practiced at present is deservedly that performed first by Dupuytren as a result of Perthes' suggestions, and also recommended by Heath; then essentially established by Partsch, and developed by him and his school. This method consists in the resection of the outer wall of the cyst so that the cystic cavity is transformed into an accessory cavity of the mouth. The method now generally accepted (Partsch's method) is based upon the happy idea of not disturbing the squamous epithelium of the cystic cavity, but, after as thorough removal as possible of the external wall, making the remaining part, which soon unites with the limiting (surrounding) oral mucosa, serve as a covering for the cavity of the wound. Thereby the tiresome suppuration and granulation formation is obviated. The details of the Partsch operation for radicular cysts are given in a concise and classically facile form by his student Williger(2). Likewise Paul Prieswerk(3) has earned permanent merit in this field of oral surgery by his superbly illustrated publication.

The writer(4) also has pictured in detail and illustrated the different forms under which radicular cysts appear. Their origin may be from the incisors, canines, or the posterior teeth. They may force forward the lamina vitrea into the vestibulum oris, or penetrate into the spongiosa, or displace the maxillary sinus; they may be sterile or infected—all of which necessarily indicate modifications of Partsch's operation.

The great service of Partsch was in developing methodically Dupuytren's procedure in the treatment of cysts, and in raising it to the grade of a type of operation. Furthermore, it is to the undying credit of Partsch and the Breslau school to have shown that the teeth or roots which have been the starting-point of radicular cysts can be conservatively treated.

Perthes(5) says: "The carious or pulpless tooth, which is regarded as the starting-point for the cyst, is extracted before or after the opening of the cyst. Only in exceptional cases is the offending tooth to be retained by dental methods, namely, when the tooth in question is one of the anterior teeth, and at worst is only slightly carious. In such cases the first consideration is removal of the pulp, sterilization of the canal, filling, and apical resection."

Partsch, with remarkable insight, recognized the possibility of conservative treatment of teeth involved in radicular cysts. Julius Witzel(6) enthusiastically adopted the Partsch operation, and proved, partly from the literature and partly through his own investigations, that dead teeth or dead roots, as a whole, cannot be held accountable for the origin of radicular cysts.

ETIOLOGY OF RADICULAR CYSTS.

We know on the basis of the studies of the above mentioned authors, as well as those of Parreidt, Roese, Roemer, and many others, that radicular cysts are caused by chronic irritation, exerted by the putrid contents of dead teeth or roots upon Malassez'(7)(8) "periodontal epithelial débris," which represents the remnants of the Brunn-Hertwig epithelial sheath.

As above mentioned, there are exceptions to this rule. At times radicular cysts may develop on teeth with vital pulps. Two such cases I have established beyond doubt by their reaction to the electric current and by roentgenographs. One was the case of a lad of thirteen with a cyst the size of a cherry, starting from a second maxillary incisor; the other was that of a Bulgarian engineer with a cyst displacing the entire hard palate. In both cases there was a history of trauma and subsequent large hematomata. Obviously these had afforded the stimulus for cyst formation.

As a result of this knowledge, the extent of the carious process in the tooth occasioning the cyst is not of moment—though almost invariably teeth with penetrating caries occur in cases of radicular cysts—but only whether or not it be curable. On the other hand, to conservative dentists the roots of molars are just as valuable as those of the anterior teeth, when they can be made to serve as bases for crowns or abutments for bridges—a perfectly realizable goal for the scientifically educated dentist.

Of the newer operative methods, those of Jacques and Hoffmann must be mentioned as the most interesting. Perthes reports—"Jacques, in cases of maxillary cysts, has extirpated the cyst wall, proceeding from the buccal pocket. Then, between the resulting cavity in the bone and the nose, a communication as broad as possible is established either toward the maxillary sinus or toward the lower nasal duct, whereupon the way of access from the buccal pocket is again closed by the approximation of the prepared mucosa flaps." In a similar manner Hoffman has broadly opened the cyst from the facial side after reflecting the mucosa; then—but without extirpating the cyst wall—a wide breach is made in the nasal wall of the cyst, when it is packed and the gauze strip is led to the nostril, while the wound in the facial mucosa is closed and proceeds to primary union.

Neither method appears to have found any imitators; Jacques', perhaps, because the same disadvantages are inherent which I have enumerated above in the description of extirpation. I do not follow Hoffmann's method because (1) after-treatment (whether the way of approach closes quickly or not as the rearrangement of the displaced neighboring structures and the shrinkage of the atrophying cyst are completed) is only accomplished through the nose with great difficulty, and (2) because the nasal drainage, necessary for a long time, is surely more disagreeable to the patient than drainage from the vestibulum oris.

Neuschmidt's (of Dortmund) method of removing the buccal cyst wall with the Paquelin cautery I find remarkably effective and worthy of attention, although it is not mentioned in Perthes'(1) chapter which treats of the cysts of the jaws in so detailed a manner. This procedure, on account of its simplicity and strict asepsis, is doubtless commendable for cysts protruding into the vestibulum oris or against extended, edentulous parts of the alveolar process, where the bone has already been absorbed. However, if thick bony walls and long strong roots stand in the way and must be first removed, Partsch's operation is indicated. Likewise it seems to me unlikely that in cases of cysts lying far distal to and deeply embedded in the bone of the maxilla or mandible one could apply the Paquelin cautery without burning the neighboring soft tissues.

The methods of filling radicular cysts with plastics had at first glance much to recommend them. Witzel and Neumann, according to Perthes' report, filled "in a few cases the cavities of the cysts with paraffin without extirpating the cystic walls and reported good results." It was surprising however to find that the cystic wall showed itself specially adapted for the resorption of paraffin, and therefore this method did not prove practical.

"Von Mosetig-Moorhof, the first to advocate the method of bone filling, as well as Ernst, applied Von Mosetig's iodoform mass for the same purpose. The cyst wall was in these cases first carefully and completely extirpated, then the carefully dried cavity was filled and the wound in the mucosa (in one case, where the mandible had been entered from the outside, the wound in the skin) was united. The progress of healing was uneventful, although in one case the cavity, which was filled, communicated through the alveolus of an extracted tooth with the outside. In a few weeks the outbulging of the jaw, which was caused by the cystic cavity, now filled with the iodoform mass, flattened itself significantly. Hitherto only a few cases have been operated upon according to this method. Whether it possesses essential advantages over Partsch's simple procedure remains to be proved by further application of the method.

FILLING THE CYST CAVITY WITH SCHROEDER'S BONE MASS.

Still more promising would seem the filling of cavities in the jaw-bones, resulting from the extirpation of radicular or follicular cysts, with Schroeder's(9) new bone mass. This substance is the result of thorough chemical investigations and physiological experiments. Schroeder found a substance just as plastic and as easily workable as the well-known iodoform mass, which in a short time becomes so firm that it supports greatly weakened bones, and which further stimulates regeneration of the bone and periosteum in the weakened region. The material consists of a powder and a liquid to be mixed together. Both constituents may be sterilized by heating to 100° C. Immediately before use they are thoroughly mixed, forming an extraordinarily plastic mass, which hardens in from five to ten minutes, and which—this point is of chief importance—corresponds approximately to the composition of bone.

The powder consists of tribasic calcium phosphate $Ca_3(PO_4)_2$, which occurs in nature as "phosphorite" and in combination with calcium fluorid as "apatite."

"Technically the tribasic calcium phosphate is secured by precipitation of a solution of calcium chlorid ($CaCl_2$), diluted with ammonia, by sodium phosphate. The fluid of the bone mass consists of an aqueous orthophosphoric acid which is saturated with magnesium oxid, so that the simple basic magnesium phosphate ($MgHPO_4$) results. By mixture of the powder and liquid a compound is formed which corresponds approximately to the formula $MgCaH_2(PO_4)_2$—*i.e.* dibasic calcium magnesium phosphate, which substance supplies about 80 per cent. of the inorganic constituents of bone."

Schroeder further writes: "This mass we have sufficiently tested by animal experimentation in regard to its reactionless absorption and possibility of becoming organized. It has been used in an entire series of cases for filling depleted cystic cavities, and, where there was careful closure of the mucosa, the process of healing was uneventful, and organization resulted. Naturally the cystic sacs must be completely emptied, so that the filling mass may come into direct contact with the spongiosa of the bone. Williger, in the new edition of his 'Leitfaden der Zahnaerztlichen Chirurgie,' alludes to the application of Schroeder's mass for the filling of emptied cysts."

It is almost indubitable that in certain appropriate cases this procedure will prove successful. Small cysts, particularly in the region of the teeth anterior to the first molars, which offer no difficulties to thorough extirpation of the cystic lining and an exact closure, will unquestionably form the indicated cases for this welcome innovation, because no after-treatment is necessary. Whether inaccessible cysts, starting from the molars, will present insurmountable difficulties to the complete removal of the cystic wall and to correct suturing, and whether in larger cysts, which offend cosmetically, the *restitutio ad integrum* will not take longer than under the Partsch method, can only be determined by comparative observations of the two methods.

For the assurance of permanence of results, the faultless filling of the roots of teeth recognized as "causing" the radicular cyst is of the greatest importance. If the teeth which have a share in cyst formation or in the infection of a cyst cannot be recognized by clinical data, roentgenographic examination will almost always clearly indicate them.

For more than a year a controversy was waged between a very efficient Austrian dentist and some very deserving young German authors upon the question of whether the root-canals of devitalized teeth which had caused abscess or cyst formation should be filled before or after resection of the root apex. I had already independently reached the conclusion that it was best to fill the root-canal only after the cystic cavity was cleaned and dried, and when the cross-section of the removed root apex (or perhaps only its extreme end which had been curetted with a bur) lay clearly before me.

Exceptions to the above rule of procedure are found in those cases where the root-canal already the point of origin of a periapical infection serves as the support of a crown or as an abutment for a bridge, and is carrying a post. Frey(10) and Williger(11) have also published their practical experiences, which go to show that without prejudicing the success of the operation, the post need not be removed before the completion of the resection of the root apex. On the basis of three cases of this kind in close sequence, I can confirm these observations.

The sole task remaining to me in closing is that of describing the therapeutic measures which are applicable to the treatment of follicular cysts. In general, as far as concerns the latter pathological structures, Partsch's method remains supreme. Of course, according to the peculiarities of the individual case, more or less significant modifications as to the details of this type of operation will appear necessary or advantageous. I have recently fully described(12) one such modification in a case of follicular cyst on a lower third molar; and others would be demanded in cases of cysts around retained canines.

Such modifications are especially necessary in very large cysts, as for example one described by Dupuytren, which had reached the size of a child's head, or those observed by Preindelsberger and Jungnickel,(1) where the body and ramus of the mandible were included in the cyst, and where the tumor must necessarily be approached extra-orally. Cutaneous-periosteal flaps must be prepared so that they may be made to serve as the covering of the wound surfaces in the cystic cavity.

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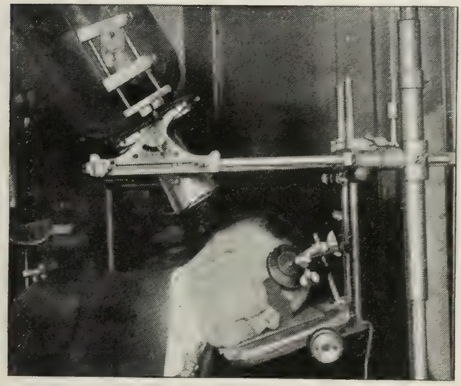
Stereoscopic Technique in Dental and Maxillary Roentgenography.

By ROBERT H. IVY, M.D., D.D.S., Milwaukee, Wis.

ROENTGENOGRAMS as ordinarily made are flat pictures, *i.e.* they do not give any perspective, and it is generally impossible in such a picture to determine the relative positions of given parts except in two dimensions. In the majority of dental conditions in which the X-ray is an aid in diagnosis, the simple flat odontograms give all necessary information; but occasionally one meets with a case, such as an impacted unerupted tooth, a foreign body, or a fracture, in which the information obtained from a stereoscopic view is of inestimable value, yielding as it does a picture of almost equal clearness and perspective as would be obtained by actual visual examination of the hard tissues involved. In the case of an unerupted canine, for instance, it is impossible to determine from a single film whether the unerupted tooth lies on the labial or the palatal aspect of the other teeth. Two films made on stereoscopic principles and viewed through the hand stereoscope will readily give the exact relations of the teeth in question.

FIG. 1.



Position of head, tube, and stand for second stereoscopic plate exposure, left side.

FIG. 2.

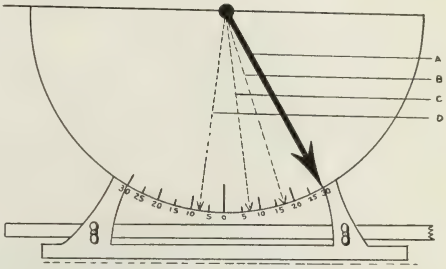
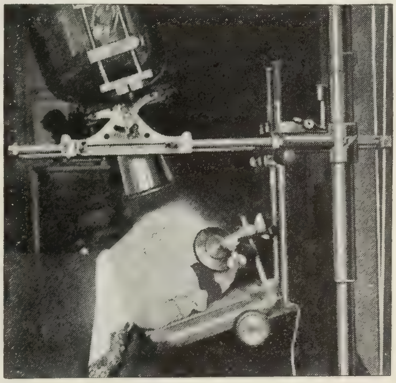


FIG. 3.



Position of head, tube, and stand for second stereoscopic plate exposure, left side.

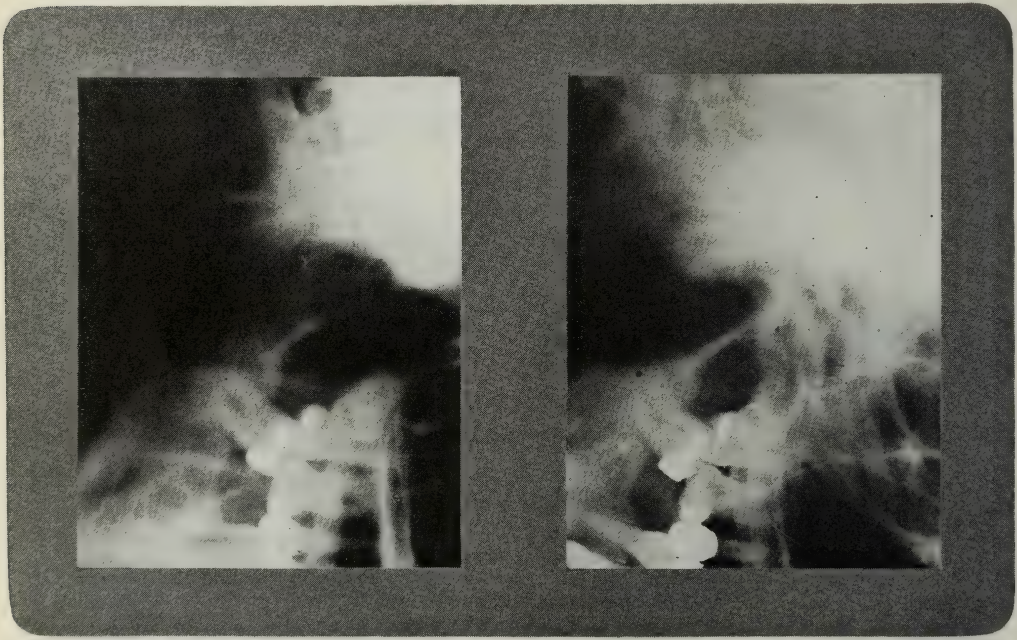
In making stereograms of the teeth and jaws either plates or films are employed, according to the location and extent of the area involved.

For showing conditions about individual teeth, especially in the front of the mouth, films may be used, while plates are more suitable in cases involving the posterior part of the mouth, such as impacted third molars, or where a considerable area is to be examined, as in the case of fractures, embedded bullets, etc.

The technique of plate stereograms will be described first. The stand employed is the Kelly-Koett, provided with a head-clamp and special plate-rest as seen in Fig. 1. The plate (5 × 7 in.) is exposed with the patient in a sitting position. The plate-rest is fixed at an angle of 15 degrees downward from the horizontal, and is placed 19 inches from the target. For the first exposure the tube-holder and funnel are drawn out to the full length of the horizontal arm of the stand, and tipped inwardly at an angle of 30 degrees from the vertical (Figs. 1 and 2, A). The patient is now seated somewhat to the right or left of the stand with the head laid upon the plate-rest in such a position that the focal ray will pass through the mastoid process of the uppermost side of the head. This position brings the uppermost side of the mandible in as nearly a perpendicular position as possible to the base of the funnel, thus minimizing overlapping of the two sides.

If canine and premolar regions are particularly desired, the patient's nose should be pressed against the plate, while for molars the nose should be slightly raised from the plate. The head-clamp is now tightened, and the exposure made. The patient is instructed to keep the head in exactly the same position for the two exposures, as any movement will interfere with the stereoscopic effect. Care must also be taken to place the second plate in exactly the same position as the first, which is easily accomplished by means of lines ruled on the plate-rest. The first plate having been slid out from under the patient's head and the second plate placed in the same position, the tube is shifted 3 inches in toward the stand. In order for the central ray to

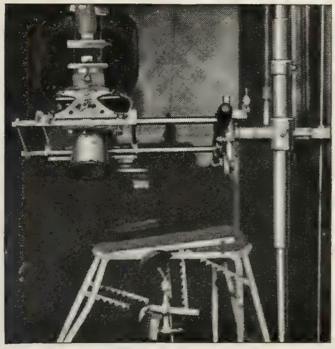
FIG. 4.



Method of mounting stereoscopic lantern slides for viewing through hand stereoscope.

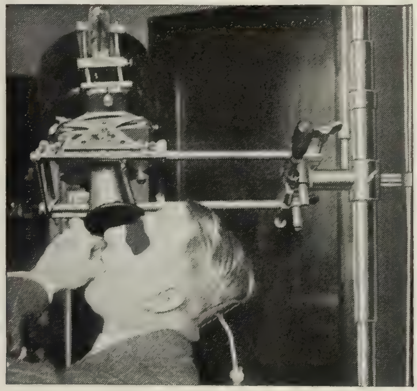
strike the second plate at the same point as in the first, it becomes necessary to change the angle of the funnel to 17½ degrees from the vertical (Figs. 3 and 2, B). The second exposure is now made, exactly the same time being given as in the first exposure. After development the plates may of course be viewed through the large Wheatstone stereoscope. If this instrument is not available, lantern slides or prints can be made from corresponding parts of the two plates, and viewed very satisfactorily through the ordinary hand stereoscope.

FIG. 5.



Position of stand and tube "centered" before making stereoscopic films.

FIG. 6.

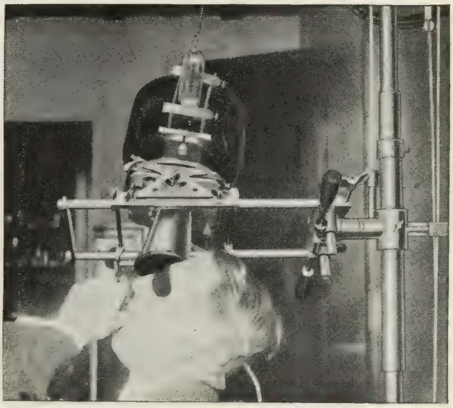


Position of head, tube, and stand for first stereoscopic film exposure.

In viewing these plates through the stereoscope it must be remembered that they must be placed sidewise, owing to the direction in which the tube is shifted between exposures. In mounting the lantern slides for the stereoscope a cover-glass is made by washing the emulsion off of an old 5 × 7 in. plate, cutting it down to 4 × 7 in., and fastening the slides to this with paper or cloth binding-strips. (See Fig. 4.)

In making intra-oral films stereoscopically, the most important points to be observed are that the patient's head and the films must be in the same position for the two exposures. The angles for the tube-holder are based on a working distance of 16 inches from target to film. The plate-rest is first removed from the stand. The tube-holder is then tipped sidewise at an angle to suit the individual case, in the plane at right angles to the dental arch of the patient. In the plane parallel to the dental arch the funnel is in a vertical position. (See Fig. 5.) The patient is now seated in the chair, with the head supported by the head-rest in such a position from the end of the funnel that with the film in the mouth against the teeth to be studied there will be approximately a distance of 16 inches from target to film. The position should also be adjusted to avoid distortion as

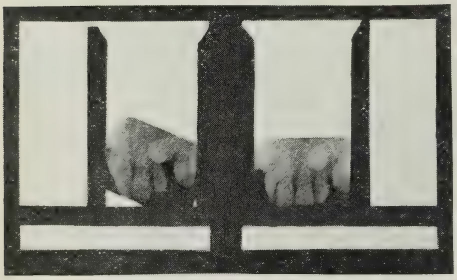
FIG. 7.



Position of head, tube, and stand for second stereoscopic film exposure.

much as possible. This "centering" having been accomplished, the tube is placed in position for the first exposure by moving it $1\frac{1}{2}$ inches to the left of the central point, and tipping it inward at an angle of $7\frac{1}{2}$ degrees from the vertical plane. This will bring the focal ray to the same spot on the film as with the tube in the central position (Figs. 6 and 2, D). After the first exposure has been made, the second film is quickly inserted in the same position in the mouth as the first, care being taken not to move the patient's head. The tube is now shifted 3 inches to the right and tipped at an angle of $7\frac{1}{2}$ degrees from the vertical in the opposite direction from that of the first exposure, so that the central ray will again converge on the same spot on the film. (See Figs. 7 and 2, C.)

FIG. 8.

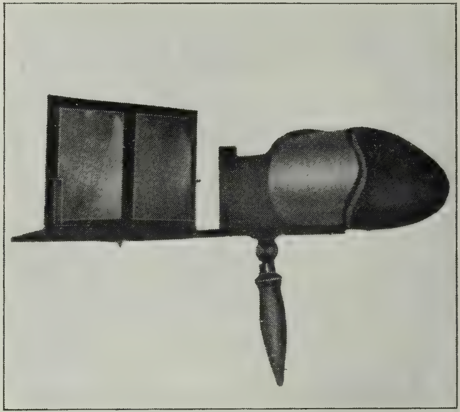


Method of mounting stereoscopic films for examination with hand stereoscope.

In viewing dental films through the stereoscope the difficulty in mounting them so that identical objects in the two films will be on the same level is overcome by the following plan: A piece of glass is cut from an old 5 × 7 in. plate to a suitable size to fit the stereoscope (4 × 7 in.). To this are applied pieces of paper binding-strip which have been previously folded longitudinally so that only about one-third of the original width of the gummed side is exposed. In this manner two slots are formed, into which the films will fit at approximately the proper distance apart. The films are thus not mounted in absolutely fixed positions, but can be slid up and down and even slightly obliquely, so that they can be readily adjusted to such positions that the two images will merge when focused (Fig. 8). Fig. 9 is a view of the ordinary hand stereoscope employed.

Fig. 4 illustrates the value of stereoscopic roentgenography in locating an unerupted impacted upper third molar. There were no signs to indicate the position of this tooth by ordinary examination. Ordinarily such a tooth would be assumed to lie disto-*buccally* in relation to the second molar, and a single X-ray plate of this case would only confirm this assumption. Stereoscopic plates, however, showed that the third molar lay on the disto-*palatal* aspect of the second molar. The operative incision was made at this point, the tooth readily found, and laceration of the buccal side of the gum was avoided.

FIG. 9.



Stereoscope.

This is but one example of the many uses to which stereoscopic methods may be put. They should prove of great value in war injuries of the jaws, especially in fractures and for locating bullets and other foreign bodies.

FIRST NATIONAL BANK BLDG.

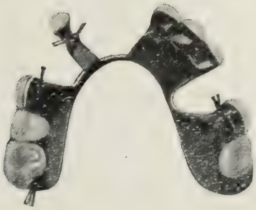
A Detachable Bridge Denture.

By LEONARD M. MARKHAM, M.B., B.S., L.D.S., Newcastle-on-Tyne, England.

THE photograph Fig 1 represents a bridge denture for the maxillæ, supported by six parallel split attachments, five of which engage within parallel slots in gold inlays, the sixth being received in a triangular-shaped recess in a gold shell crown.

The crowned tooth only is "dead." In October 1911, when the bridge denture was first inserted, the teeth were all rather loose on account of overstrain in mastication, but today they are very firm indeed.

FIG. 1.



The parallelometer used was very kindly made to my design by Messrs. Ash & Sons, London. It has arms which can be clamped firmly to a grooved horseshoe-shaped base-plate, made small enough to lie well within the dental arch. The arms carry a chuck device for clamping the jigs. With this exception, everything was made in the laboratory.

The advantages of this type of denture are the great support derived from its contact with the gums in mastication, the freedom of each tooth to move slightly during mastication, the exposure of enamel to friction, and the ease with which scrupulous cleanliness can be maintained.

Except that some of the Steele facings are occasionally broken away by the pressure of a tobacco-pipe stem, and the loss recently of one-half of a split lug, the service that the apparatus has rendered during its five and one-half years of wear has been quite satisfactory.

FIG. 2.

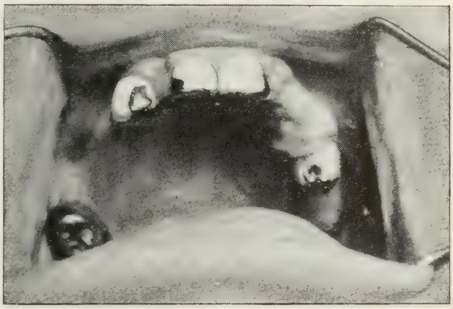
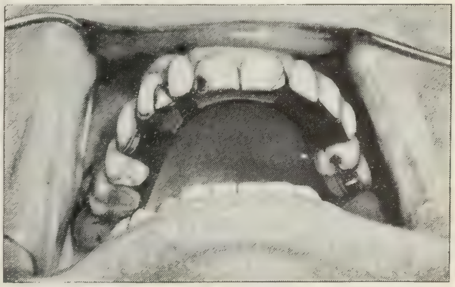


FIG. 3.



1 VICTORIA SQUARE.

CORRESPONDENCE

Pioneer Army Dentists in the Philippines.

TO THE EDITOR OF THE DENTAL COSMOS:

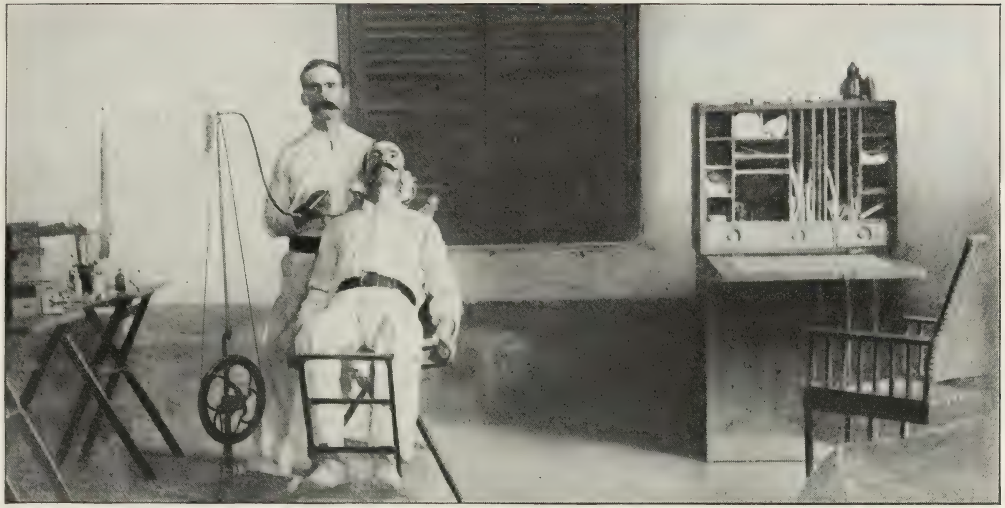
Sir,—Soon after getting to the camp in the Richmond racetrack district at San Francisco, Cal., in May 1898, a matter of some 160 hospital corps men reported to me for duty in that camp. Within the next two or three days two of these men came to me and gave their names as W. H. Ware and John Gibbons. As I now recall, Ware was the spokesman, and they said to me, "Major Owen, we have enlisted as hospital corps men in the hope that we might be able by our personal work to demonstrate that dentists may be of service to an army." I said, "Very well, then; go to your deans and friends in the city and have yourselves properly vouched for to me, and I will then talk further with you. I like the thought which you offer me." In the course of a few days they returned to me, properly vouched for as competent men. I thereupon said to them, "I want you to prepare a requisition for the necessary dental supplies that you will require for the number of men in the Philippine expedition for twelve months. I do not want you to leave out any instruments that you feel are necessary for the work, and I want you to have the drugs that you are accustomed to use. Now, make out this requisition and have the sergeant include it in the requisition that I am making for the Surgeon-general." These men made up a requisition for two complete dental outfits, which were issued and were taken by me to the Philippine Islands. Soon after our arrival in the islands, one day, in a hurry in signing papers, I unfortunately overlooked the fact that John Gibbons was detailed away from the group remaining under my personal supervision. Ware, however, went with the detachment under my personal charge to the little island of Corregidor in the mouth of Manila Bay, where I was directed to establish a convalescent hospital for the 8th Army Corps in the city of Manila.

In one of the old buildings where there was a good light I established Ware as a dental surgeon, and he was kept busy at this work, doing absolutely nothing else but dental work, with one or more assistants to help him keep his room and materials in proper shape, to enable him to do his work as a decent operator should be allowed to do it. It was soon discovered that there was a competent dentist, with proper tools, on duty at the convalescent hospital, and the result was that Ware was kept busy all the time to the limit of his personal capacity to labor—and his capacity was good. He worked hard, and I have regretted more than I can say that Ware, who would now be one of the oldest men in the service, little by little, with hope deferred of ever receiving a commission so that he would be on a permanent footing, at last felt that he was compelled to resign and return to civil life in order to make a position for himself. He was a good man, a good dentist, and a good friend, and I have carried since those days a warm place in my heart for a man who rendered me a loyal and untiring service.

Gibbons, instead of being detailed to do work with his dental outfit, like many another poor boy sought the ex-

PIONEER DENTISTRY IN THE U. S. ARMY.

(PHILIPPINE ISLANDS, 1898.)



U.S Dental Office in Corregidor Convalescent Hospital, P. I.
This is supposed to be the first Dental Office, semi-official in character in the history of the U. S. Army. Operating outfit furnished by the Surgeon General of the U. S.
Dec. 3-1898 Yours respectfully W. H. Ware, DDS.

citement of the battlefield, and one day, returning from the firing-line between the handle-bars of a litter, bringing from the battlefield a wounded officer, Gibbons received a bullet which passed through his heart, and the poor boy died on the field of battle, doing his duty as an upright, honest man. I am sure from the papers and other matters that have come to my attention concerning him that had he been permitted by the Great Master he would have proved himself as faithful to his duty as a dentist as he was in the capacity of litter-bearer on the field of battle.

I inclose you herewith a copy of the picture of Ware with his operating outfit. This is the very first dentist who was ever officially employed in the United States army. My interview with Ware and Gibbons was early in May 1898.

Very sincerely yours,

W. O. Owen,
Col. Med. Corps, U. S. Army.

Washington, D. C., April 24, 1917.

Affiliation of the Oral Branch of Medicine with the Parent Body in the State of Maryland.

To the Editor of the Dental Cosmos:

Sir,—A golden opportunity has recently been afforded both the oral specialist and the general practitioner of medicine, by the passage of the following amendments by the Medical and Chirurgical Faculty of Maryland, at the recent annual meeting:

> *Add:* Sec. 4—Associate Members: "The members of the Maryland State Dental Association in good standing with their own society shall be designated as associate members."
>
> *Add:* Chap. VII, Committees; Sec. 3—The Library Committee . . . . "shall consist of five members of the faculty and one associate member, the last to be elected yearly by the Maryland State Dental Association."

This will give the Dental Association a permanent and handsome home where all meetings can be held, access to one of the finest libraries in the country, and an opportunity to attend all the scientific meetings of the Faculty and its several departments.

Dr. Clarence J. Grieves has been elected as the representative of the association upon the library committee for the ensuing year.

It is hard to estimate the importance of this advance from the standpoint of the dental practitioner; and if the general practitioners and other specialists of medicine who so sadly need information upon oral subjects will take advantage of the opportunity thus afforded, the all-around benefits cannot be computed by the usual standards of profit.

As a member of the Medical and Chirurgical Faculty for more than thirty years, and one of the original members and first secretary of the Maryland State Dental Association, this affiliation brings to pass one of my long-cherished hopes and dreams.

B. Merrill Hopkinson,
D.C.D., A.M., M.D.

Baltimore, Md.

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Dental Faculties Association of American Universities.

Ninth Annual Meeting, held at Philadelphia, Pa., January 26, 1917.

THE annual meeting of the Dental Faculties Association of American Universities was called to order on Friday, January 26, 1917, at 10 A.M., by the president, Dr. F. T. Breene, in Hotel Adelphia, Philadelphia, Pa.

Members of the association present were:

University of Minnesota, College of Dentistry, Minneapolis, Minn.
Dr. ALFRED OWRE, *Dean.*
University of Iowa, College of Dentistry, Iowa City, Ia.
Dr. F. T. BREENE, *Dean.*
University of Michigan, College of Dental Surgery, Ann Arbor, Mich.
Dr. M. L. WARD, *Dean.*
The Thomas W. Evans Museum and Dental Institute School of Dentistry University of Pennsylvania, Philadelphia, Pa.
Dr. EDWARD C. KIRK, *Dean.*
Harvard Dental School, Boston, Mass.
Dr. EUGENE H. SMITH, *Dean.*
Washington University Dental School, St. Louis, Mo.
Dr. J. H. KENNERLY, *Dean.*
University of California, College of Dentistry, San Francisco, Cal.
Dr. GUY S. MILLBERRY, *Dean.*

The first order of business was the reading of the minutes of the previous annual session. Motion was made and carried to dispense with the reading of the minutes, for the reason that they had been published in full in the printed Transactions of the association and distributed to the members.

The next order of business was the reading of the Address by the President. Dr. BREENE called to the chair Dr. J. H. Kennerly, vice-president, while he read his annual address, as follows:

President's Address.

By F. T. BREENE, D.D.S., M.D.

Members of the Dental Faculties Association of American Universities,—In pursuance of my duties as presiding officer of this honorable body, I wish to call your attention to some of the recommendations of former presiding officers, as well as to a few suggestions which may not be new, but which I believe are pertinent to the interests of dental education.

The adjustment of the proposed four-year curriculum has brought us to the point of realization where we wonder how it was possible to crowd the present three-year course of study into the time allotted. It would seem that the time occupied in pursuing academic subjects now a content of the four-year curriculum is needed for dental instruction. To facilitate the furtherance of dental teaching, we would suggest that as soon as practicable a pre-dental course, of from one to two years in an approved college of arts and sciences, be made a requisite for admission to university dental schools.

STANDARDIZATION OF DENTAL SCHOOLS.

The Educational Council of America has presented a schedule of subject hours for class A dental colleges. The work accomplished by the Educational Council has been for the betterment of dental educational conditions. If fixed headquarters and funds for the employment of a permanent secretary were provided, this council could produce better results; they have been hampered by the lack of funds and sufficient time to devote to careful investigation of colleges. It must be recognized that it is the method of instruction and the pedagogic application of methods that produce subject results, and not scheduled hours. In other words, an analysis of the interior workings of a college, a survey of each course, methods of instruction, and results obtained, should be the basis for college classification.

The result of annual and cumulative tabulation of state examining board reports is not a definite means of judging the educational efficiency of dental colleges. The element of chance should be eliminated in college standardization. To use the hazards with which a graduate comes into contact—from graduation to tabulation—as data for the standardization of professional colleges is unsafe and absurd.

Not until dental colleges are standardized and classified by some authorized agency that will eliminate from its conclusions all of the elements of bias and prejudice—not until then will a satisfactory solution of this vital problem be reached.

The suggestion of Dean Sharp in his address as president of this association in 1912 would seem a most satisfactory solution of the problem of standardization of dental colleges: "Equitable standardization of dental collges can be best obtained by co-operation with the bureau of Education at Washington, and by furthering an investigation by the Carnegie Foundation."

PREVENTIVE DENTISTRY.

Your attention is called to the great future of dentistry in public health service as a means of conserving the health of the masses by public instruction in preventive dentistry. The appalling percentage of defective teeth and deformities reported as the result of the examination of the mouths of children in public schools, employees of industrial plants, institutional inmates, and army recruiting stations, indicates that the education of both dentist and layman has been neglected from the viewpoint of preventive dentistry. The faculty of the College of Dentistry of the State University of Iowa has petitioned the Iowa State Board of Education to establish a chair of preventive dentistry. It is believed that the request will be granted. The scope of the work as planned for this department is in part as follows: Instruction in oral hygiene and prophylaxis to dental students and hygienists; to co-operate with the university extension department in organizing municipal, industrial, and institutional dental dispensaries, and to outline and establish methods of teaching oral hygiene in the public schools of the state.

DENTAL HYGIENISTS.

Several states have legalized the dental hygienist, and similar action is contemplated in many other states. We believe that the dental hygienist has come to stay. It would seem within the province of this association to decide as to the advisability of instituting a course in university dental colleges for the education of dental hygienists.

If, in your opinion, a course of this character is desirable, a definite program should be outlined as to the requisite preliminary education of applicants, character and extent of the curriculum, length of session to be required, and form of certificate to be conferred when the course is satisfactorily completed.

POSTGRADUATE INSTRUCTION.

Although Miller presented in 1890 records of the relation of oral diseases to systemic conditions, the truth of his statements has but recently been recognized. The undergraduate of today is taught modern theories and methods of practice. But what of the graduate of the past? This presents an educational problem that should be considered.

The following plans for graduate work have been suggested: (1) That undergraduate colleges divide their energies and give postgraduate instruction; (2) that a graduate college should be a separate department with a separate faculty, but be affiliated with an undergraduate college; (3) that the graduate college should be a separate institution without undergraduate affiliations.

If the undergraduate colleges are to present postgraduate courses of instruction, it would seem advisable that definite standards should be arranged whereby a graduate course would be considered from the educational conception of the term, as a dignified attainment in higher education.

Dr. Kirk moved that the address be received and opened to discussion by the association. (Motion carried.)

DISCUSSION.

Dr. Kirk said that the question of postgraduate instruction was a very important one to the association, not only as a means for providing further instruction or education for the man willing and capable of taking advanced instruction, but that the colleges of the association should develop a systematic scheme for instruction—an advanced department of instruction to which the graduate or the man who is qualified to practice dentistry would normally advance. The whole trend of dentistry was bringing it into closer relationship with the system already standardized in Europe in medicine and dentistry, where the student qualifies for medicine after completing his course of instruction, and having passed an examination is licensed to practice medicine or surgery; then, if he continues his studies for a given period in addition to his work in a hospital, he receives his degree of doctor of medicine, after giving evidence of his higher training. In Germany we find two grades of practitioners, the Zahntechniker, the man who is not permitted to operate in the mouth, and we have the Zahnärzte, who are the qualified licensed practitioners. He thought that in the process of evolution we were being forced into the necessity of considering some such division in dentistry as exists in Germany today. We have no provision for the man who is characterized as the mechanical dentist, who is practicing dentistry as an art and not as a science, as distinguished from the man who is practicing from the scientific, biologic aspect, and it seemed that we must make some provision for instruction leading to a higher degree for men who wish to go higher. In order to obtain the higher qualification it should be required that the student shall earn a certain definite number of credits, but not necessarily in a certain specified time.

With regard to the dental hygienist, that was something that must come; there are and will be objections, of course, but the dental hygienist is inevitable, and we must establish proper standards and provide for the systematic instruction of dental hygienists.

Finally he asked the association to consider the question of the Preparedness League of American Dentists. He had been in communication with the men who have had in hand the preparation and instruction of a course for the training of men in dental and oral war surgery; and he thought that we should endeavor to provide means of education for graduates in dentistry so as to qualify them to do efficient work in that field. He believed that this should be done under the supervision and with the aid of the national government, and was of the opinion that such co-operation could be obtained.

Dr. Smith did not believe that the superstructure which Dr. Kirk outlined could properly be built upon a strictly dental foundation. He did not believe it was possible to develop the men Dr. Kirk expected from the general product of men entering the dental schools. He did not think we would ever win the respect and admiration of the medical and surgical men until we placed with them men who have a foundation equal to their own. Some years ago he had suggested to this body that we co-operate with the medical schools in a scheme that would educate the specialist in dentistry as other specialists in medicine are educated, and equally well. His plan was for the dental student to take two years' college training, three years in medicine, and in the fourth year elect dental studies, being graduated with the medical degree, but with dentistry as his specialty. With that sort of foundation he thought we could build any kind of superstructure desired.

Dr. Millberry thought there were two points in the President's Address that might be ignored in considering the problems of the association, namely, the Educational Council and the state board tabulation reports, as they had not proved themselves to be of any value. With regard to the pre-dental course, he said three plans had been suggested to the board of regents of the University of California, viz—first, a course equivalent to that set up for matriculation in medicine; second, two years' pre-dental work as indorsed by the medical school, plus three years of dental training; and third, the adoption of a four-year course to be submitted to the various members of this association. Dr. Millberry was glad to note that the University of Iowa had recommended a professorship in preventive dentistry, and thought that might create a popular demand for the dental hygienist. The board of regents of the University of California have approved of a course of one year of instruction in this work, based on high-school graduation, to enable those taking the course to render hygienic service to the dentist. He was impressed with Dr. Kirk's scheme for postgraduate instruction in the various departments of the schools, and wondered if this association would be disposed to go on record as willing to grant a special degree after the completion of such a course of postgraduate instruction. He was sure that California would be willing to do so.

Dr. Owre thought that one of the most important points in the address was the reference to steps that must be taken to prepare for college work—that is, predental work. He had in mind to recommend to this association some definite action that would bind the association to the establishment of one year of academic preparation not later than 1921. Dr. Owre agreed with the idea of postgraduate instruction, but thought it best to establish first one year of academic work as a preliminary requirement.

With regard to the dental hygienist, he thought all agreed that some provision would have to be made for such a course of instruction. In the medical world, the professional nurse was required to take a three-year course and a high-school course was required as preparation. The dental nurse, he thought, should have a course of training and a preliminary educational qualification somewhat similar to that of the medical nurse.

With regard to war surgery, he thought that the dental schools must sooner or later place themselves on a higher footing, or they would not be able to draw from the general material for such men.

As to the item of membership, as mentioned by the president, he considered it desirable to increase the membership of the association in an endeavor to make a more inclusive organization that would carry more weight and authority when suggestions and recommendations were made to the various institutions of the country. He said the present organization did not fill this need, and thought that possibly some such result could be obtained by the affiliation of an association such as this with the National Dental Association, which seemed to be the most representative body.

Dr. Ward said, with regard to Dr. Owre's last suggestion, that he hoped the time would never come when the National Dental Association would have to do with establishing the standards for dental schools. He said that his school had objected to inspection by the Educational Council, and would continue to do so until the movement was on a different footing. They did not object in the least to an impartial inspection, but he did not think it was done in the proper way at present. The one point that impressed him in the President's Address was the necessity for better preparation along medical lines. With regard to the postgraduate degree, he said that his institution at present granted a degree for postgraduate work of a certain type continued for a number of years; this was confined to research work, chiefly. It was a question whether this practice should be continued or not. With regard to arrangements for meeting the demands of the man who wanted to pursue further work, they had for some time extended the courtesies of the clinic and other facilities to Michigan men who wished to do further work, but the board of regents had not allowed the dental department to inaugurate a regular postgraduate course of instruction.

Dr. Smith said that with regard to dental hygienists, in Massachusetts the legislature had provided for these hygienists, and that the Forsyth institution in Boston was conducting a course of instruction for the dental hygienist. He thought all that was necessary was to have properly trained women for this work. He said that Dr. Owre had spoken of one-year academic training, and referred to the handy man in medicine; he thought that we were producing the same handy man in dentistry with a little more collegiate training, and that we should therefore start and give the men more medicine.

Dr. Kirk said that, to properly understand the subjects given in the curriculum, the student should have a thoroughly good academic training before he starts at all, and that was why he favored the advance of the pre-dental standards.

Dr. Millberry did not think it wise for the association to obligate itself to do things that the universities represented would not accept. It seemed best that these objects should be set as the ideal toward which the different institutions might work.

Dr. Owre said that his thought was to present this in the way of a suggestion to the governing bodies of the institutions represented in the association, with the object of having it adopted as binding in 1921.

Dr. Kirk said that Dr. Smith's idea was to matriculate the dental student as a medical man, and give him two or three years in medicine, and then let him taper off with dentistry as an elective, but that he (Dr. Kirk) was opposed to beginning the making of a dentist by first making a medical man. With reference to the development of medical training on top of dental education, he was in accord with that for the group of men who were going to do that kind of work. If the schools were teaching the fundamental medical sciences as they should, the men were as well taught as in the medical school, and if we were not doing that we were not doing our duty.

Dr. Breene said that what he had in mind with reference to the suggestions made was a resolution empowering the Educational Committee to formulate a curriculum for postgraduate work, and to outline some definite plan for the instruction of dental hygienists, and also a plan for the one-year academic work as a pre-requisite for the dental course.

Dr. Owre moved that the members of the association recommend to their governing bodies the requirement of one year of prescribed academic work as a preliminary to the dental course, to take effect in 1920; also that they be asked to establish a course of postgraduate instruction, and a course of instruction for dental hygienists. (Motion carried.)

The next order of business was the report of the Secretary-Treasurer, by Dr. KIRK, as follows:

Report of Secretary-Treasurer.

By E. C. KIRK, D.D.S., Sc.D., LL.D.

Mr. President and members of the Dental Faculties Association of American Universities,—As Secretary-Treasurer I have to report that during the year there has only been the usual clerical business, which has been attended to in the office of the secretary.

I have to present herewith the application of the University of Buffalo, Dental Department, for membership in our association, as follows:

BUFFALO, January 20, 1917.

TO THE DENTAL FACULTIES ASSOCIATION OF AMERICAN UNIVERSITIES:

Gentlemen,—The University of Buffalo, Dental Department, hereby makes application for membership in the Dental Faculties Association of American Universities. A department of arts and sciences has been established in our university, giving now its third year of instruction. The years already completed (first and second) have been recognized by the regents of the University of the State of New York.

The requirements for admission to the dental department are those established by the regents. The course of dental instruction will be four years, beginning with the session 1917-18. The school year consists of thirty-two teaching weeks.

DANIEL H. SQUIRE, *Dean.*

I have to present the minutes of the meeting in Albany, and wish to call to your attention some of the discussion therein relating to the four-year curriculum, from the point of view of the regents of the State of New York.

I have further to present the following exhibit of the financial condition of our association:

Receipts.	
Balance 1915-16	$475.87
Receipts for dues 1916-17	350.00
Total receipts	$825.87
Expenditures.	
Clerical services	$200.00
Stationery	3.00
Transactions	59.00
Postage	4.55
Total expenditures	$266.55
Balance 1917-18	$559.32

Respectfully submitted,

EDWARD C. KIRK,
Sec'y-Treasurer.

Dr. Kennerly moved that a copy of the report of the Albany meeting be sent to each member of the association. (Motion carried.)

Dr. Owre moved that the application of the University of Buffalo, Dental Department, be received and referred to the Executive Committee. (Motion carried.)

Dr. Kennerly moved that the Treasurer's report be accepted. (Motion carried.)

The question of increase of the membership of the association was then discussed by Drs. Kennerly, Smith, Owre, and Kirk, after which Dr. Owre made the following motion:

Dr. Owre. I move that the secretary be instructed to write to these schools—University of Ohio, Dental Department; University of Illinois, Dental Department, and Northwestern University, Dental School—calling their attention to the desirability of becoming members of the Dental Faculties Association of American Universities. (Motion carried.)

The next order of business was the report of the Educational Committee, Dr. OWRE, chairman, as follows:

Report of the Educational Committee.

PHILADELPHIA, PA., January 26, 1917.

OWING to the fact that the past year has been largely one of crystallization, there is little for this committee to report save that the published programs of the various dental schools conform in the main to the Chicago resolution of 1915.

The progress of dentistry makes imperative a second forward step in dental education. The public, the medical profession, and the dental profession itself are demanding that the dentist be better and better qualified for his important task. We should at once refer to our faculties and governing bodies the question of inaugurating a pre-dental year, to go into effect not later than 1921. With this end in view, I would ask that each college submit to the chairman of this committee suggestions for the curriculum to be adopted for the preparatory year, as well as for the four years following.

ALFRED OWRE, *Chairman,*
E. H. SMITH,
E. C. KIRK,
F. T. BREENE,
Committee.

Dr. Millberry moved that the report be accepted. (Motion carried.)

Dr. Kirk, as chairman of a special committee to report on the status of the two Japanese schools, reported that he had received their prospectuses, outlining the courses, and had made inquiry in various directions with regard to the two schools, and as the result thereof recommended that graduates of the two Japanese schools be accepted in schools of the Dental Faculties Association on the same basis as those from any other school outside of the association.

Dr. Millberry moved that the report be accepted. (Motion carried.)

The next order of business was the election of officers, which resulted as follows:

President—Dr. F. T. Breene, Iowa City, Iowa.

Vice-president—Dr. J. H. Kennerly, St. Louis, Mo.

Secretary-Treasurer—Dr. Edward C. Kirk, Philadelphia, Pa.

Executive Committee—Dr. M. L. Ward, chairman, Dr. G. S. Millberry, and F. T. Breene, *ex-officio.*

Educational Committee—Dr. Alfred Owre, chairman, Dr. E. H. Smith, Dr. E. C. Kirk, and Dr. F. T. Breene, *ex-officio.*

Motion was then made and carried to adjourn subject to the call of the Executive Committee.

Northeastern Dental Association.

Twenty-second Annual Convention, at Hartford, Conn., October 11, 12, and 13, 1916.

(Continued from page 652.)

WEDNESDAY—*Evening Session.*

THE meeting was called to order at 8 P.M. by the president, Dr. Cary.

Dr. Cary announced as the first item on the program for the evening session a paper by Dr. JAS. KENDALL BURGESS, New York City, entitled "Further Consideration of the Pinlay (Posterior) and the Pinledge (Anterior) Bridge Attachments."

[This paper is printed in full at page 681 of the present issue of the COSMOS.]

DISCUSSION.

Dr. Leslie P. Abbe, Hartford, Conn. I watched Dr. Burgess at the clinic this afternoon, and was much impressed with the usefulness of his method. I have employed it, in a way, but did not get quite the square-shoulder preparation that he recommends. I can understand the mechanics of his method, and realize that the flat sharp shoulder that he mentions gives a better anchorage.

Dr. R. O. Schlosser, Hartford, Conn. Personally this inlay appeals to me as being stronger than any other substitute for the gold crown. I think that in my hands it would be a little more difficult to parallel the holes for the pins. The danger, in the preparation of the so-called approximal cup, of weakening the supports of both the lingual and the buccal cusps is something that I cannot get away from. In the preparation of the ledge on the anterior teeth, I believe with Dr. Burgess that one can secure very good anchorage, and that there the one point to be borne in mind is to be careful not to encroach upon the pulp. When we consider, however, that we are putting in a fixed piece of bridge work, and when we take into consideration the surfaces it is to rest on, I think it is a question as to whether, under the stress of articulation, there may not be a loosening of the anchorage. That has been the trouble with many other anchorages of the inlay type, but of course we know that we are getting more support by the use of these pins; so it is possible that it will stand up better, and give us the support for bridges that we have heretofore looked for in the crown.

Dr. J. W. Harper, Hartford, Conn. I have been doing this same kind of work for some years, but it is a little different from that of Dr. Burgess. I do not presume to think that it is so delicate a piece of work as his, but it may be interesting for me to tell you the difference. Instead of using 1000-fine pure gold, I have accomplished results in the same manner by using plate gold, 22-k. silver alloy, 34 gage. After preparing the cavity, I take a little Ash plunger with some sealing-wax, or good red wax, and make an impression of the cavity. Then I take a little square of this gold plate, put it in place over the impression, and hammer it home. I give it frequent annealings, and with the matrix in place in the cavity burnish with instruments right against the gold, without any paper. I remove, trim the overlapping edges, re-anneal and burnish home to satisfaction, and then fill with solder. Of course the pins have previously been set in place and soldered. I admit that the method of Dr. Burgess with 1000-fine gold is better, but it is interesting to know what results one can obtain with gold as thick as 34-gage, 22-k. silver alloy. Moreover, there is no breaking of the matrix as in thinner gold.

I have made stabilizers in the lower incisor teeth in the following way: Instead of cutting the lingual surface of the tooth, I simply drill little pinholes on each side of the pulp, take my impression in wax, as before, stamp up gold backings, punch holes for the pins, insert in place, hold with sticky-wax, remove, invest, and solder.

If you have a case where the incisal edge comes against the teeth or the upper teeth bite over the lower teeth there is no strain on it. After soldering each separately I solder the piece as a whole, and get very good results.

At another meeting I showed a piece where the first molar was missing. The patient complained that food would get in between the bicuspids. If you make the two fillings, there is pressure when food is chewed, causing final separation of the second from the first bicuspid, because of space behind the second bicuspid unless you bridge the space. If you knuckle these teeth, you may still have separation of the teeth. Therefore I resorted to this same method, using two inlays with pins, soldered together, and set, and the piece is in practical use today. The molar may be bridged to a bicuspid in the same way, by taking advantage of cavities. I think that we should look out for these cases in which there are large approximal and occlusal fillings. You often have these in molars, and they are ideal cases for this class of work. Simply cut the cavities out, countersink, and prepare them in the way the essayist tells us. Then make the matrix and put in the bridge work in that way.

I do not say that my method is as good as his, but I have described it in order to show what can be done with plate gold. How much greater adaptability can be obtained by the method shown by Dr. Burgess tonight is a matter for our consideration.

Dr. Abbe. I should like to ask Dr. Burgess whether he is using in the mouth the metal he spoke of.

Dr. Burgess. I fully realized when reading the paper that it is very confusing to listen to all this multiplicity of angles and grooves. I do not see how anyone could follow it so as to discuss it intelligently after hearing it only once, or even twice. It should be read with the cuts or models before you, going over the angles and grooves as indicated; in that way you will find that the method is not so complicated as it sounds.

Dr. Abbe asked me to say something about the metal that I am using now. I said that I formerly used iridio-platinum, but recently I have used a metal called noxidium, which is composed of metals of the platinum group. It does not corrode, is very tough, and stands a high heat. It sells at three dollars a pennyweight, as against five and a half for iridio-platinum. I have no fear but that it will do all that is required in regard to standing the strain. The pins are very small, and unless the metal used in them is tough, you cannot depend upon it. A clasp-metal wire would be liable to burn, and would also be too brittle for such use.

Dr. Schlosser has spoken about the formation of the approximal groove, and what he considers the consequent weakening of the walls. I think he is laboring under a misapprehension as to the width and depth of the groove. I do not go deep enough to weaken the walls.

I am asked if I have ever had any bridges loosen. I certainly have. Indeed, I have had every accident in the catalog, and I do not think that anyone who is trying to advance, even a little, will get through without some mishaps. A small percentage of my bridges have loosened, but the underlying principle was right. In the cases of failure I blame myself. It was bad engineering on my part, to start with, or poor technique, or perhaps both. I have not had a large percentage of these accidents, but I have made some mistakes.

Dr. Harper has given you a different method, and I do not object to that; I said in the latter part of my paper that I had described my method but that I should discredit your individuality if I did not believe there were other methods to be used. If there were only one way, and everyone had to employ that way, there would not be nearly so much chance of success. The doctor, however, has spoken of drilling the openings so as to straddle the pulp, but without forming the shoulders.

Dr. Harper. In certain cases of lower incisors with no strain on them.

Dr. Burgess. In such cases no doubt that would work out all right, but the underlying principle is not so good, because where there are two inclined planes working together, with no shoulder to break the force of the strain, whatever strain is brought to bear comes on the pins. Where there is strain, therefore, you would have to use larger pins or more of them. In my method, I have a sharp angle and a flat shoulder, so that whatever strain is put on them is directly on the tooth, and not on the pins. The pins merely serve to hold the attachment in good position.

Dr. G. M. Griswold, Hartford, Conn. I should like to ask one question. Do you not find many cavities in which you can use an inlay without pins?

Dr. Burgess. I do not doubt that there may be cavities formed in devitalized teeth in which one might use the inlay without the pins, but the object in employing the pin is to lessen the bulk of metal. If you do without the pin, you will have to deepen the cavity and make the inlay larger. In a live tooth you would by that means bring a larger bulk of metal into closer proximity with the pulp, and increase the danger to it. I like to get away from that. I believe in conservation of pulp tissue, and because by using the pins I can use less metal and keep it farther from the pulp, I should not like to do without the pins in this style of bridge attachment. In two or three cases I have used a different preparation, which I hope to present at some other time, doing away with the pins except at one point, but I have not yet had sufficient experience with this form of preparation to speak of it at this time. In these inlays, however, I should not like to discard the pins, because, in order to do so, I should have to weaken the walls and encroach upon the pulp.

Dr. Griswold. I have used inlays for abutments, but I have never used pins, feeling that they would endanger the pulp more than the inlay itself would. You have answered that, but I think that there are cases in which the inlay is sufficiently strong without the pins.

Dr. Burgess. If you make them

deep enough, there is no doubt of that. But I consider it better dentistry and better engineering to use them.

Dr. George H. Wright, Boston, then read a paper entitled "A Study of Tissue Fluids and Absorption as Related to Conservative and Radical Reasons for and Against Extraction of Teeth."

The association then adjourned until Thursday afternoon.

Thursday—*Afternoon Session.*

The meeting was called to order at 4.30 p.m. by the president.

The report of the Nominating Committee was made by Dr. F. T. Murlless of Hartford, as follows:

President—Dr. David Manson, Burlington, Vt.

First Vice-president—Ira B. Stilson, Providence, R. I.

Second Vice-president—Albert W. Crosby, New Haven, Conn.

Secretary—Alvin A. Hunt, Hartford, Conn.

Assistant Secretary—Leslie A. Spelman, Hartford, Conn.

Treasurer—Frederick H. Saunders, Westfield, Mass.

Librarian—William A. Young, Concord, N. H.

Editor—Irving E. Pendleton, Lewiston, Me.

A motion was made that the report be accepted and that the secretary be instructed to cast the vote of the association for the list of nominations for officers. (Motion carried.)

The Secretary then read a communication from Dr. Thomas J. Barrett of Worcester, Mass., also a letter from Mr. W. J. Coulin of the chamber of commerce of that city, inviting the society to meet in Worcester in 1917.

On motion of Dr. B. A. Sears of Hartford, the matter was referred to the incoming Board of Censors.

Dr. Murlless then spoke about the Preparedness League, and read a letter from Dr. J. W. Beach of Buffalo, chairman of that organization, giving some information as to the activities of the League.

Adjourned until the evening session.

(To be continued.)

Academy of Stomatology of Philadelphia.

Regular Monthly Meeting, held March 27, 1917.

The regular monthly meeting of the Academy of Stomatology of Philadelphia was called to order on Tuesday evening, March 27, 1917, at 8 o'clock, by the president, Dr. E. R. Sausser.

The paper of the evening was entitled "Novocain Conductive Anesthesia in Exodontia," by Dr. L. Biddle Duffield, Philadelphia, Pa.

[This paper is printed in full at page 709 of the present issue of the Cosmos.]

Dr. Duffield being unable to be present, his paper was read by Dr. R. H. Riethmüller, New York City, who also exhibited lantern-slides.

DISCUSSION.

Dr. Hermann Prinz. I have had the privilege of looking over this excellent paper by Dr. Duffield, and as he has presented the matter of local anesthesia in the classical form as first outlined by Braun, there is very little further to say in regard to the technique of the various types of injection. In my remarks I shall eliminate general anesthesia, and confine myself to a few points relative to the nature of local anesthesia.

The title of the paper is "Novocain Conductive Anesthesia in Exodontia." There are two terms employed in this title which do not appeal to me personally. First of all, there is no such thing as "conductive" anesthesia; it should be "conduction" anesthesia. We do not conduct the anesthetic; we produce anesthesia by conduction. Our best authorities on this subject, including Murray, the great lexicographer of the English language, confirm this statement. Therefore in all our books in which the term "conductive anesthesia" is used it is employed in a loose manner, and should be changed to "conduction" anesthesia.

Again, "exodontia" is a term that is painful to my ear. It is a mongrel term, and misconstructed at that. I happen to know something about the birth of this term, and recall the time when it was created for the man who introduced it. I think the term "extractor" and "extraction" are far more significant.

Regarding the use of suprarenin as an addition to a local anesthetic solution, we should be extremely guarded relative to the quantity of this highly reactive compound. Ordinarily, we add one drop of the suprarenin solution (1 : 1000) to one cubic centimeter of the anesthetic solution. But as we increase the quantity of the solution to be employed for a single injection, we must proportionally reduce the amount of suprarenin. Usually we employ it according to the following graded schedule:

Suprarenin.

One drop	added to	1	cc.	anesthetic	sol.
Two drops	"	3	"	"	"
Three "	"	5	"	"	"
Four "	"	8	"	"	"
Five "	"	10	"	"	"

If we employ the suprarenin in the above proportions we avoid to a large extent the toxic effects which are prone to occur if we use it in too large quantities. When given by the mouth, suprarenin is largely destroyed by its passage through the intestinal wall and is then practically devoid of action.

The next important question—and I am speaking only from the standpoint of the clinical practitioner, and not from that of the experimenter in a pharmacological laboratory—is that much emphasis has been laid by Dr. Duffield on the use of Ringer's solution on account of its isotonicity. From close observation in pharmacological laboratories, as well as in clinical practice, we know that simple salt solution used as a base for our anesthetic solution will do the work as well as any of the more complicated solutions, including Ringer's or Locke's, etc. The ordinary physiologic salt solution containing about 0.85 sodium chlorid is, from a clinical point of view, in every respect equal to Ringer's solution. The minute quantities of the additional calcium and potassium ions in the very few cubic centimeters which constitute the average injection for dental purposes is too small to be of any traceable influence on the involved cell structure. I have discussed this point, pro and con., with the best pharmacologists here and abroad, and from carefully conducted laboratory experiments I have been unable to see any difference in its clinical aspect. The sole object of using an isotonic solution is to avoid hemolysis, and the simple physiologic salt solution answers this purpose very well.

Dr. Duffield frequently referred to the anastomosis of nerves. Nerves never anastomose, although they may interlace. This may have been a slip of the pen. The essayist also referred at various times to the "cribriform plate" of the maxilla! It may be that Dr. Duffield chooses to call certain bony structures of the maxilla a cribriform plate. In the books on anatomy the term cribriform plate is restricted to the specific bony tissue in the ethmoid bone.

Dr. Thos. C. Aller. After listening to this excellent paper, and realizing that we have here with us the most eminent authority in this country on the subject, I am sure you must realize that I have a great deal of temerity in saying anything at all. I have felt rather antagonistic to the use of novocain and experience a sense of safety and satisfaction in the use of an old friend, nitrous oxid. It has been given in our office in over three hundred thousand cases without any bad results; and Dr. Thomas tells me that in his forty-three years of practice there was only one fatality, which was a case of cerebral apoplexy. This patient succumbed some time after the anesthesia; whether this was the only factor in the result we cannot tell. This, of course, is liable to occur with other anesthetics. I may say that in two years at Blockley I officiated in all the nitrous oxid administrations that were given. The surgeons called on me to give it in all desperate cases. In four years at the Episcopal Hospital I gave practically all the nitrous oxid that was given, and certainly to all the tedious and moribund cases that required it.

If Dr. Duffield were here, I should compliment him most highly on the excellent paper; and I might say, at the beginning, that I agree heartily with the general method that he follows. The only exception I make is that in the mandibular injection I have used a cataract knife to make the initial incision, first putting a little novocain locally into the retromolar triangle, placing my finger in this and allowing the flat side of the knife to touch the nail as a guide. Then I use the lumbar puncture needle of platinum, which one can see and control well, placing it in the opening made by the cataract knife and guiding it to the required depth. This instrument being large in diameter, and having a stylet inside, one can feel satisfied that it will not break. The idea of puncturing the skin first is to obviate the necessity of pushing the knife hard, and when you have dense tissue it seems to me somewhat advantageous to do it in that way, as it results in a clean wound. If you have a needle with the lumen open as you push it in, should there be infective material of any kind—for you cannot absolutely sterilize the skin—you might drag something in, particularly if the needle were a large one.

There are one or two things in the paper to which I might take exception in a friendly spirit. One is the rise in blood pressure which the essayist states always accompanies nitrous oxid anesthesia. The "American Year-book of Anesthesia and Analgesia," which has just come out, has in it this statement, which I will read: "It has been erroneously stated that nitrous oxid increases blood pressure. This is not clinically true. This may be used for two hours without rise, but there is a limit in which the blood pressure will fall even under nitrous oxid" (McKesson). I feel that you can get a rise in blood pressure from psychic stimuli. With an increased heartbeat there will be increased pressure. That is a factor that will raise it, but I feel that nitrous oxid *per se* will not.

He also speaks of cases of tuberculosis being particularly unfavorable. I may say that I have given quite a number of nitrous oxid anesthesias at Blockley to tuberculous cases and never had any unsatisfactory results. One patient had a large lung cavity, and I gave it on three occasions with no bad effects. At the Episcopal Hospital Dr. Frazier did a gastrotomy under nitrous oxid in a patient who had lost one lung, and in whom the other was affected.

Speaking of arterio-sclerosis and nephritis, the essayist mentioned these conditions as contra-indicating nitrous oxid, or as being more favorable to local anesthesia. As Dr. Prinz has just stated, the adrenalin is certainly highly toxic, and, as Dr. Riethmüller has mentioned, this must be guarded against. Adrenalin will produce arterio-sclerosis. If a given case were arterio-sclerotic and you should give the usual dose, it would be deleterious. We must certainly dilute the adrenalin in different cases, as Dr. Prinz has advised.

In the paper, Dr. Duffield has said that no extractor should be without these various means. I agree with him. I have at the office all kinds of anesthetics, but I do not use cocain as an injection. I am, however, heartily in favor of the others, if used with thorough surgical judgment. A man must have good technique and know his anatomy.

Speaking about the second molars, I think in all cases we should try to save the second molar. There are, however, certain cases in which this should not be done, for instance if the patient is delicate, or a case in which the roots of the second molar have been eroded, so that it has not only lost its peridental tissue, but cementum, dentin, and perhaps has an exposed nerve. Dr. Winter recommended taking out the second molar in certain cases. This of course will depend on the surgical judgment of the individual operator. Possibly my temerity about novocain at first was caused by unpleasant effects I had seen with cocain at Blockley. I have seen one case in which novocain anesthesia was produced by a man who used discretion and injected the novocain slowly, and it was followed by bad effects. I feel that when such care is used there is a margin of safety, and one can use it with fair impunity. In nephritic cases, I am opposed to using any novocain-adrenalin if I can use something else.

With regard to the question of shock, I think we should mention, of course, stimuli received from the auditory nerve and the optic nerve. You can get a certain amount of shock from hearing things. Even if a man does not say anything to shock the patient, he may have a crunching of the alveolar process during the extraction which may materially affect the patient, although there may be no pain. The sight of instruments also sometimes produces some shock. This is obviated in the use of nitrous oxid.

To cite Hatcher and Eggleston in the July 1916 issue of the *Journal of Pharmacology and Exper. Therapeutics,* the authors expressed the opinion that novocain has a distinctive field of usefulness, that it is a valuable drug, but is not without its dangers. The more these are understood, the more useful they believe the drug will become.

It is sometimes difficult to get the statistics along these lines, for if a man has very unsatisfactory or unpleasant results he does not like to record them; if he has a severe case he is likely to bury his sorrow and leave no tombstone.

Dr. Duffield says that because of the results some men obtain from analgesia, he deprecates nitrous oxid anesthesia. As a matter of fact, novocain was only introduced in 1907. Certain it is that the use of nitrous oxid and oxygen in major clinics has materially increased through the improvement in the apparatus and the writings of Crile and others since that time. Dr. Duffield is in error when he speaks of Crile having pointed out the ill effects of long anesthesia from nitrous oxid. Crile referred to the long-continued use of ether as being productive of shock. He is one of the greatest advocates of nitrous oxid, and for the particular reason that there are *no* ill effects following prolonged nitrous oxid anesthesia.

Dr. Duffield is certainly enthusiastic when he speaks of operating with this mode of anesthesia in the most complicated and extensive surgical operations without producing any pain. I had in the office today a double compound fracture of the mandible of some weeks' duration, in which there was fibrous union. Because of the nervousness of the patient and the amount of force I should have to use, I did not care to try conductive anesthesia in that case, so I gave nitrous oxid with good results.

Dr. Duffield speaks of the patient's swallowing blood, and having the adrenalin limiting the amount of bleeding. It is very true that adrenalin does limit bleeding somewhat, but it is possible to keep the blood from getting down into the pharynx or esophagus by using a gauze pad with a ligature attached.

The essayist speaks of most cases of attempted extraction that come to him as having had nitrous oxid administered. In such cases as we have had, 90 per cent. have been under cocain or some other local anesthetic.

In removing impacted third molars, I like the use of ether, because it is conceded by most authorities to be a very safe anesthetic. The Mayos have a record of fifty thousand cases without a single fatality. If we have good ether and a competent anesthetist we can get a relaxation that is impossible to obtain with other anesthetics. If the ether is given carefully and in small quantities, we have no trouble from struggling or nausea. The use of ether, of course, does away with any visual or auditory stimuli. Novocain is a good anesthetic in some of the other conditions mentioned; for instance, malposed roots, roots in the antrum, and supernumerary teeth. But with nitrous oxid the operation can be accomplished as well, and more quickly.

I heartily indorse the technique of the paper. There are just one or two other things that I want to add. I prefer to give novocain as against nitrous oxid, in cases of status lymphaticus, status epilepticus, patulent foramen ovale, bronchial asthma, angio-neurotic edema, dilated heart, myocarditis, fatty heart, and hypersensitiveness of the tongue or pharyngeal wall. I had a case of the latter in which I had to resort to ether. The patient could force himself to vomit by just pushing out his tongue. Some even claim that ether is preferable in pregnancy and lactation. Others think that it is not necessary in pregnancy—that pregnancy is not a contra-indication to nitrous oxid. In nervous children I should be opposed to using novocain, also in hypochondriacs or those whom I knew to have an idiosyncrasy against the drug.

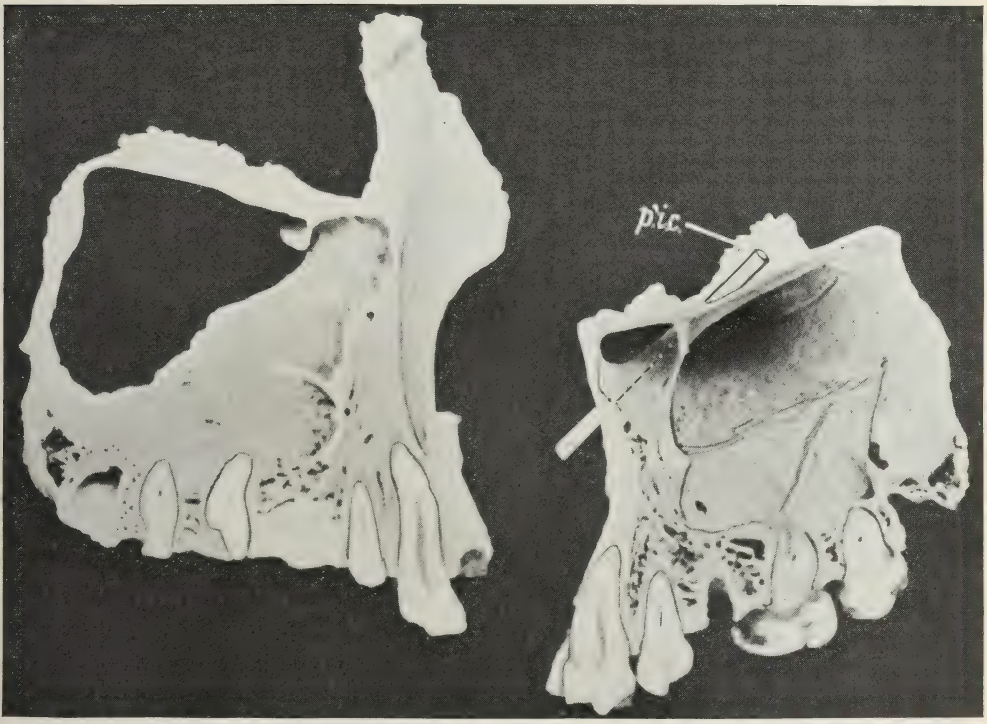
My own reason for not using novocain very often is that it takes so much more time than nitrous oxid. That is very frank, but I feel that you can do perfect justice to the patient in most instances, and yet save time. I am willing to admit, however, that novocain should be used in certain cases.

As I mentioned before, in cases of nephritics, arterio-sclerotics, and those with exophthalmic goiter, I would not advocate novocain. If the solution is not sterile, or if an overdose is given, or if it is given too fast, or if there is an idiosyncrasy against it, or if it is injected into a vein, nerve, or bloodvessel, you will have trouble. If a man is careful, there is little fear of that.

Dr. M. H. Cryer. Of course I am very much interested in this subject, but Dr. Prinz has answered the question far better than I can in regard to the application of novocain. He has asked me, however, to speak about the anatomy, and for this purpose I should like to ask Dr. Riethmüller if I might use two or three of his slides.

The paper claims that we should never extract the second molar. There are a few cases in which I think it better to extract the second molar than the third.

Fig. 1.



In "Fig. 3" (see page 714) the third molar is impacted, with the roots below those of the second molar. The roots of the second are rather deformed, and have not developed in normal shape or position, and so are liable to give trouble in the future. If the second molar be extracted there is a good chance for the third to take a useful position. On the other hand, in extracting the impacted tooth it would be necessary to cut the mandible to a considerable extent, and even then there is a possibility of damaging the second molar as well.

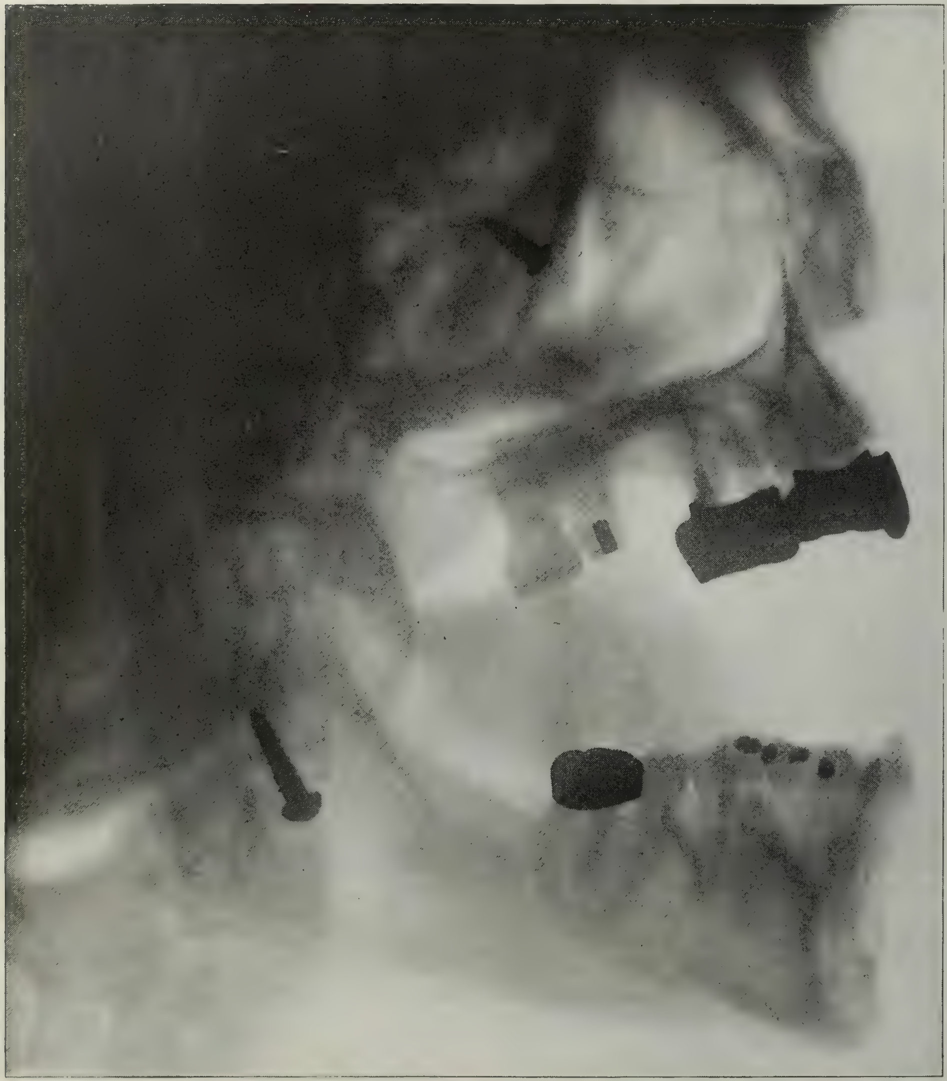
One of the essayist's slides showed an impacted third molar which could not be extracted without cutting a considerable amount of good solid bone from the mandible. By taking out the badly diseased second molar the third molar might become a useful tooth.

The essayist's "Fig. 6" (see page 715) shows an impacted third maxillary molar. The shape of the roots of the second molar and the position of the third molar would induce me to extract the second, as the roots of the second molar are absolutely deformed and sure to give further trouble—among the possibilities being neuralgia, epilepsy, or other disturbances due to reflex action. If the second molar were a perfect tooth and the roots in normal position I should of course advise the extraction of the third molar. Do not misunderstand me—I only recommend the extraction of the second molar when it is diseased or abnormal, and when there is a possibility of making a third molar useful by so doing, or in cases where extracting the third molar might produce serious damage to the jaws.

Another point in the paper is the use of the term "cribriform plate," which Dr. Duffield has used in connection with the posterior wall of the maxillary sinus. There are several foramina, perhaps three or four, but not enough to make it cribriform.

The alveolar nerve or nerves coming from the maxillary division of the trigeminal nerve—anterior to the two branches going to the spheno-palatine ganglion—passes to the infra-temporal surface of the maxilla, and then on through the bone into the maxillary sinus, as shown in Fig. 1. It gives off branches to the roots of the various teeth, including the canine, also to the mucous membrane and the alveolar process. Every tooth belonging to the maxillary bone proper is supplied by this nerve. The incisor teeth, which are not maxillary teeth, as they belong to the premaxilla, are supplied by another nerve.

FIG. 2.



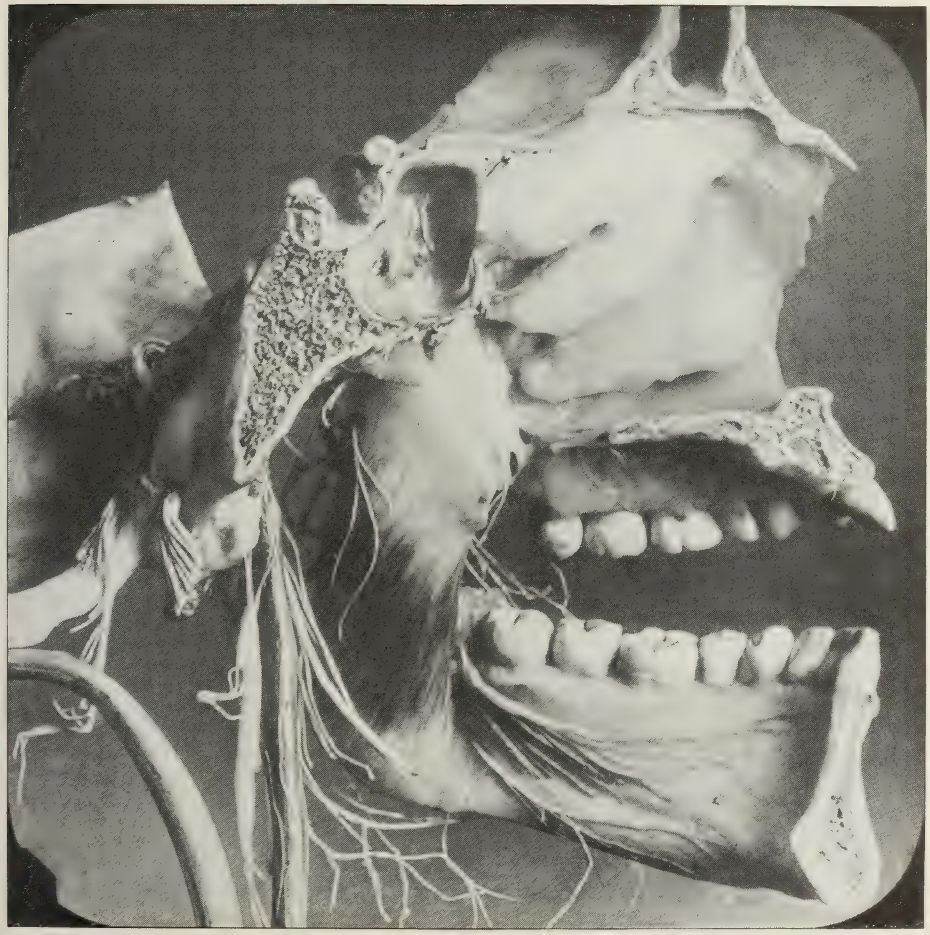
The next slide (Fig. 2) shows a case

where an operation was made for the removal of a section of the mandibular nerve. The posterior portion of the canal was plugged with a gold screw to keep the nerve from regenerating. Another opening was made near the infra-orbital foramen into the sinus, and the nerve was taken out of the infra-orbital canal, placing another gold screw in the canal to prevent the regeneration of the infra-orbital nerve. The patient was cured of neuralgia of the mandible, but not that of the maxilla. Why? If the incisor teeth alone had been involved, the pain would have been relieved, but as it was, the patient suffered the tortures of facial neuralgia afterward.

The X-ray also showed the canine and premolar teeth to be involved, and it was decided to extract them; then, taking a sharp curved elevator and going into the floor of the sinus, the alveolar nerve was reached and severed. This operation was successful in giving relief from all neuralgia.

If the sensation from the canine and premolar teeth had been conveyed by the infra-orbital nerve, the first operation should have "blocked" the sensation, whereas the sensation from the canine

Fig. 3.



and premolar teeth is conveyed by the alveolar nerve that comes through the posterior wall of the maxillary sinus.

As I mentioned before, I think it is a mistake to use the name "cribriform plate" for the posterior wall of the maxillary sinus, as that name is used by all anatomists for the horizontal plate of the ethmoid bone. This portion of the ethmoid helps to form the partition between the braincase and the nasal cavity, and upon it rests the greater portion of the olfactory bulb, from which pass the many filaments through this sievelike plate to the upper part of the nasal cavity. (See Fig. 3.) This figure also shows the internal pterygoid muscle covering the mandibular foramen and sulcus.

Fig. 4.

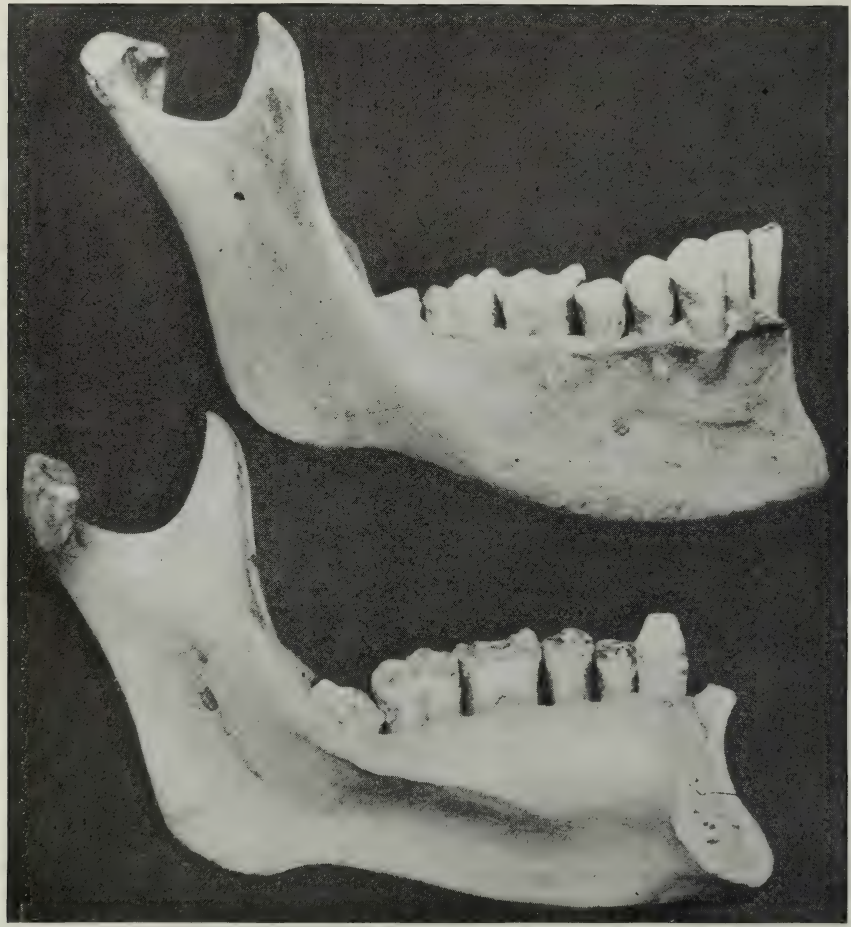


Fig. 4 shows two pictures made from the same mandible in which there are two rather badly impacted third molars. To remove either of these with the second molars in position would necessitate the cutting of too much bone, which might disturb the general health of the patient. It is possible that I should recommend the extraction of the second molar in the lower picture, as the third molar would more than likely take a good position and become a useful tooth.

The mandibular foramen and sulcus is well shown in the lower picture. One great trouble that I have noticed is that in endeavoring to inject the mandibular nerve, the operator sometimes injects the lingual nerve, causing considerable disturbance to the tongue.

Dr. Riethmüller (closing the discussion). I am in a rather unfair position, because this paper is not mine. On the other hand, I should like to extend the courtesy of an answer to the various gentlemen who have discussed Dr. Duffield's essay.

May I first answer Dr. Cryer? I naturally could not discuss the essayist's technique of removing third molars, especially impacted ones. The pictures of impacted molars were not shown in order to demonstrate any operative technique, but to illustrate the class of third molars that can be satisfactorily removed under conductive anesthesia. If I have been unclear in my explanation of the illustrations, you will excuse it, owing to my short acquaintance with the cases, which were explained to me briefly at the essayist's bedside, and which I could examine only from the lantern slides. In the case in which Dr. Cryer mentioned that it would be folly not to remove the second molar, I remember that both second and third molars were removed. We have to give the essayist credit for having sense enough to remove a tooth if it is in such a condition as shown in the plate. In one of the cases shown, the patient had suffered with epilepsy, and the removal of the third impacted molar relieved the condition.

The middle superior alveolar division has given a great deal of trouble. Dr. Blum of New York has made the most thorough compilation of the opinions of leading anatomists on this *enfant terrible* of anatomy. I have been able to convince him that a tuberosity injection if properly induced will do away with sensation in the first and second bicuspids in 75 per cent. of cases. In 25 per cent. it does not do so, probably owing to the fact that the middle superior alveolar division runs through the infraorbital canal, and these patients must be given an infra-orbital injection.

The term cribriform plate is quite correct. What Dr. Duffield means is the cribriform or sievelike condition of the bone which is found back of the tuberosity. I have a slide showing as many as thirty foramina back of the tuberosity, each as large as a small mental foramen, and clustered around a larger one.

The cribriform condition is present in other bones than the ethmoid, just as is the cancellated condition, and this term should not be restricted to any one bone.

Neither the posterior superior alveolar nor the infra-orbital nerve run through Meckel's ganglion. It is from the main maxillary or alveolar nerve that a branch, the palatine, is given off through Meckel's ganglion. Stern is wrong in attempting to reach Meckel's ganglion. The only way that this can be done satisfactorily is by going through the posterior palatine foramen with a long needle mounted on a right-angle hub, running the risk of puncturing the palatine artery, which passes through the palatine canal. This artery is variously designated as anterior or posterior palatine. If you consult the American and English editions of Gray you will find this in the comparative tables of nomenclature found at the end of the book. Why harp on names? What we are after is the actual anatomic condition.

Dr. Cryer. Maybe it does not make any difference whether you call it an incisor or a molar.

Dr. Riethmüller. That is not an argument in point. These terms have two different meanings. A filter or a sieve could be called cribriform. At any rate, clinical experience shows that by a tuberosity injection properly induced we can get anesthesia of the three molars, and, in 75 per cent. of cases, of the two bicuspids also. By infra-orbital injection we obtain satisfactory anesthesia of the three anterior teeth and the first bicuspid. We leave it to anatomists to explain this clinical observation.

The infra-orbital foramen can be palpated from the outside, the pressure causing pain in the infra-orbital nerve. I have, however, found two patients without any infra-orbital foramen.

Dr. Cryer. You can find them in the museum of the university, and also in my own collection.

Dr. Riethmüller. In the case you described, if I had a good X-ray, I should first extract the bad teeth with ferrules on them; those restorations were not crowns. The crown and bridge work in that patient's mouth was enough to cripple him.

Dr. Cryer. That is what was done.

Dr. Riethmüller. Surgeons sometimes make mistakes, but dentists are usually severely censured for theirs. Puncture of a nerve or bloodvessel, however, we can easily avoid, if a needle with a moderate amount of bevel is employed, and is very slowly advanced in the manner of a delicate probe.

In patients from four to seventy years of age, who usually come to the dentist with a terrific fear, conductive anesthesia can be induced absolutely without trouble and without producing any pain or without frightening the patients, whereas, if a general anesthetic is used, they think they are going to die. I consider this form of anesthesia to be a proper method to employ. I am sorry, Dr. Cryer, that we do not agree; but that is what makes life pleasant.

Dr. Cryer. Anastomosing of nerves is spoken of in the paper. Sensory nerves pass from the periphery to the sensorium by an axis-cylinder that is not bifurcated, and does not unite with another nerve directly. Arteries, veins, and capillaries anastomose and run into one another, but I think the use of that term in relation to the nerves is inaccurate. Nerves do interlace, as in the plexus along the carotid arteries, but they do not enter one into another. They convey impressions one to another, but not by anastomosis.

Dr. Riethmüller. That is a very interesting point, which we must leave to the anatomists to settle. But from our clinical experience we were prompted to believe that there was a nerve anastomosis. If we inject the lower jaw at the mandibular foramen, we obtain full anesthesia up to the first bicuspid, but not usually in the three anterior teeth. Whether this is due to anastomosis or interlacing with or overlapping the mandibular nerve of the opposite side, the result is the same from a clinical point of view. We should be glad to get enlightenment on this point, however. Some anatomists have been averse to our efforts regarding conductive anesthesia. If we had a perfect knowledge of the anatomy of the nerves concerned, our discussion would be superfluous.

Dr. Prinz has also discussed terms. He prefers to say conduction anesthesia; but I think that whether we call it conductive or conduction is immaterial. It means the same thing. You may call it nerve-blocking, if you wish. No one knows just what happens when conductive anesthesia is induced.

Dr. Prinz. Yes, we do know.

Dr. Riethmüller. Well, what? You say conduction of the anesthetic solution from one nerve cell to another. That is a description, not an explanation.

Dr. Prinz. It is you who say that; not I. It is a question of pharmacology. When you speak of producing anesthesia, we know how it is done.

Dr. Riethmüller. I should like to know how it is conducted from one cell to another.

Dr. Prinz. It must be conduction. If you look up the definition, you will find that I am correct.

Dr. Riethmüller. Please explain how conductive anesthesia is produced. We know the clinical results, but not what occurs.

Dr. Prinz. If we inhibit the function of the peripheral nerves in a circumscribed area of tissue we refer to this process as terminal anesthesia; while if we block the conductivity of a sensory nerve trunk somewhere between the brain and the periphery we speak of it as conduction anesthesia. By injecting into a nerve trunk we obtain endoneural anesthesia. When we inject into tissues surrounding a nerve trunk we get perineural anesthesia. Local anesthesia may be produced as follows: Cocain, novocain, and numerous other local anesthetics, possess a definite affinity for the living protoplasm of the nerve cell.

They enter with it into a labile union, thus producing local anesthesia, which lasts until this temporary union is broken up by releasing the chemical—not as the original compound, however, but broken up into simpler bodies. The living tissues rid themselves of the poison in some unknown manner. In dead tissues the injected local anesthetic does not undergo any alteration.

Dr. Riethmüller. This is a very long description. Why do we get anesthesia if we inject normal salt solution?

Dr. Prinz. If you can get perfect anesthesia from salt solution, why use cocain?

Dr. Riethmüller. We get it, if we use an excessive quantity. Schleich came to the conclusion that cocain was superfluous.

Dr. Prinz. Then we come back to the point that we do not use it because we do not want to produce pain, as Schleich did.

Dr. Riethmüller. You do not produce pain by the use of normal salt solution.

Dr. Prinz. Well, you do not produce anesthesia. If we could produce anesthesia with normal salt solution, we should dispense with the expense and the poisoning of novocain. You can produce anesthesia with it; you can produce anesthesia with pure distilled water, but it is painful anesthesia. Distilled water is a poison to the nerve cells. You want to avoid that, and so use the local anesthetic that has the least toxicity—novocain in a 2 per cent. solution, or whatever it may be.

Dr. Riethmüller. You are speaking of anesthesia that, in a limited time, can be produced by the injection of ordinary water. This produces osmosis. But that is not the point. I claim that we do not know just what happens when an anesthetic solution comes in contact with a nerve trunk. We have certain explanations, but they are absolutely and entirely theoretical.

Now as to "exodontia." I am not particularly fond of that term, because it is a mixture of Latin and Greek elements.

Dr. Prinz. This is my personal conception only.

Dr. Riethmüller. In regard to suprarenin, I think that no scientist should use the word "drop." What is a drop? You can obtain different numbers and sizes of drops from different pipets with the same quantity of suprarenin. I think that it is best to leave the dosage of suprarenin to trained pharmacologists such as the makers of novocain-suprarenin tablets employ. Suprarenin is generally marketed in a 1 : 1000 solution. Organic adrenalin, as marketed by different drug firms, greatly varies in toxicity. As to the effect of adrenalin, why does it stop hemorrhage? Because it contracts the muscular coat of the artery or vein.

As to salt solution and Ringer's solution: I am sorry that Dr. Prinz does not like Ringer's solution. I have been able to convince a few people that Ringer's is better than salt, and most hospitals use it. The small admixture of calcium and potassium chlorids seems to have distinct advantages. There is no comparison between the use of Ringer's solution in major surgical cases and in dental cases, in which latter, at most, from 12 to 14 cc. are injected. The Ringer solution has the special advantage that the dentist has to make it himself. The practitioner who orders distilled water from a drug store is not certain of its purity and sterility. Hydrant water should not be used, no matter how long it is boiled. Moreover, certain communities have entirely alkaline drinking water. Surely only *bona fide* sterile distilled water should be used. I think the advocacy of hydrant water is a dangerous doctrine.

We read every day about the dangers from hidden foci of infection. If we employ conductive anesthesia, we get away from these foci of infection, and do not produce systemic infection by forcing infectious matter into deeper strata of tissues.

Unforeseen disturbances from novocain will not occur, if the patient's case has first been properly diagnosed. Toxic symptoms are not so much due to novocain as to adrenalin. In such cases the admixture of adrenalin should be omitted.

Dr. Aller is a strong advocate of nitrous oxid and oxygen. He has cited Dr. Thomas; I shall re-cite him. He said before the Pennsylvania State Dental Society, three or four years ago, that he thought nitrous oxid and oxygen the most dangerous anesthetic that could be used.

Dr. Aller. For long operations.

Dr. Riethmüller. The statement was made as regards anesthesia in general. I have just looked it up again, and have it pretty well in mind. Even so, there is no question that nitrous oxid and oxygen is an ideal anesthetic in cases where it is indicated.

The trocar needle is extremely painful to introduce. It is too big, and there is danger of injecting air with the solution. There is absolutely no pain from the proper insertion of our small needle.

Psychic stimuli can be eliminated by proper previous medication. If a patient insists on "going to sleep," let him do so, by the use of nitrous oxid and oxygen. It would be poor judgment to force him to submit to conductive anesthesia. Prolonged operations, however, are tolerated better when conductive anesthesia is employed. Moreover, the patient's mind can be appealed to, and shock can be eliminated to a great extent by the operator's personality.

In arterio-sclerosis and other pathologic conditions, the suprarenin is omitted. The comparison with cocain is unfair. Everyone is afraid of cocain, because he knows of the toxic symptoms that arise from its use. Any man who uses it is his own worst enemy. Moreover, the operator might start the cocain habit in a patient. Many habitués go to the dentist merely for the purpose of stealing cocain. Post-operative pain can be relieved by dressing the wound with novocain powder. Shock can largely be overcome by covering the patient's eyes and the use of preliminary medication.

The citation in regard to novocain from the *Journal of Pharmacology* I do not consider fair. Some writers have collected every case of embolism as an argument against the use of novocain. I would not advocate that every dentist should employ novocain, because some men have not the slightest appreciation of asepsis—of sterility of solutions or of instruments. What will happen if such men make injections into the deeper strata of tissues? The surprising phase of the situation is that, considering the large number of men who have been using cocain and are now employing novocain, no fatal results have been reported. Crile uses novocain for the same reason that Duffield uses it, to produce anoci-association, and to do away with shock as much as possible. The cases of bad results from local anesthesia occur with operators who give the patient a "shot" of cocain, as they call it. They employ an old metal syringe that cannot be sterilized satisfactorily, and inject stale, contaminated solutions under excessive pressure. That is not local anesthesia, and such operators are a public menace.

The Mayos have been mentioned. Not all dentists are Mayos, unfortunately; and I do not think that ether is as desirable in dental practice as conductive anesthesia. The method of choice should always be that which involves the least danger.

My remark regarding the X-rays was misunderstood. I said that some of the X-rays shown are poor. These were taken by a number of practitioners who referred the cases to Dr. Duffield, and did not show up very well, especially after having been made into lantern slides.

Before administering a general anesthetic, the operator must find out whether the patient has recently taken a meal, and of what consistence and bulk, all of which takes time. Under general anesthesia any change in the patient's position must be made by the operator. Besides, for an hour or two afterward usually the patient is obliged to remain at the operator's office because of nausea.

Dr. Aller. You will find none in mine. Come down and see.

Dr. Riethmüller. You are a notable exception, then. The patients after a general anesthesia do not get up from the operating chair right away and walk out. They do, however, after conductive anesthesia. You have to request them to take a rest. Instead of being afraid that conductive anesthesia will produce shock, and therefore sticking to nitrous oxid, why do you not try both? Some people are trying *at* conductive anesthesia, but not trying *it*. Dr. Duffield first came in contact with it two or three years ago, and when I showed him two or three cases he was very skeptical. That is the experience of every oral surgeon and extractor in the country. If you give conductive anesthesia a fair trial, you will use it. There is no doubt that your patients will appreciate it.

Dr. Aller. In regard to cocain, I merely said that in my experience I had given up the use of cocain because I had given it myself, and had had unpleasant effects to follow. I merely brought that up as a side issue, intending to show that before novocain came into use I had been unfavorably impressed with local anesthesia. If you give morphin, you may cultivate a habit also, just as in the case of cocain. As to scopolamin it is a dangerous drug, and I do not like to use it. Chloral hydrate likewise is dangerous. I am perfectly willing to feel that the men quoted know, when they say they can give a cat chloral hydrate, and then by making an injection of novocain, readily kill it, while it takes ten times as big a dose of novocain to kill a cat if it has not previously had chloral hydrate administered; it is not good, however, to use novocain in conjunction with drugs. If you give a patient morphin and let him go out, especially if he has an idiosyncrasy against it, there may be dangerous consequences.

Dr. Riethmüller. The dentist should make the solution himself. As for morphin, I have injected it only once, and that was the only case in which it was necessary.

Dr. Aller. In a case in which I helped Dr. Dorrance, the patient was killed by using scopolamin and morphin. It was not a heavy dose of scopolamin—1/150. We were going to ligate the external carotid, and were trying to get him under ether. You speak very disparagingly of ether. May I ask how many times you have given it?

Dr. Riethmüller. I just said that the administration of ether is followed by nausea, and that the danger associated with its use should make any dentist chary.

Dr. Aller. In nine patients out of ten, there is no nausea if ether is given properly. I have a right to feel confident about this.

Dr. Riethmüller. If you recommend its use to practitioners in general they will say, "We can do it just as well;" and there will be trouble.

Dr. Aller. An emergency with nitrous oxid is urgent; with ether it is less so.

Dr. Riethmüller. A discussion like this is good for all of us, because it shows how much we can learn from each other.

The society then adjourned.

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

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PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Virgin Islands, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, JULY 1917.

EDITORIAL DEPARTMENT

Oral Hygiene and Military Service.

THE history of all progressive movements is characterized by certain well-marked periods of acceleration resulting from the stimulus exerted by a newly discovered principle; the evolution of dentistry is no exception to the general rule. Until the epoch-making discoveries of Koch created the science of microbiology and permanently settled the rôle which many of the bacterial organisms play in the causation of disease, the dominating *motif* of dentistry was almost purely mechanical. Manipulative skill, mechanical inventiveness, constructive ability and resourcefulness in reparative work, constituted the primary ideals of dental training and continued to be the goal of professional achievement.

Inspired by the work of his master teacher, Koch, the mind of W. D. Miller was early directed to the study of the bacterial flora of the oral cavity and the relations of the infected mouth to bodily disease. His first studies were rewarded by the discovery of the intimate nature of the process of dental caries; following which, in a series of papers on "The Human Mouth as a Focus of Infection," Miller demonstrated the general truth that the infected mouth is the source of infection, the portal of entry by which the majority of pathogenic germs gain access to the body, and he appears to have been one of the first, if not the first, to demonstrate that metastatic infections may be established from a distant focal point by organisms transported via the circulation.

The work of Miller waited for a quarter of a century in order that his colleagues might have time to grow into an appreciation of the surpassing importance of that work to the well-being and happiness of humanity. In the history of dentistry, and indeed of medical science, Miller's work will stand forever as marking an epoch. Gradually, but none the less with certainty, the truths wrought out by Miller found their place in the curricula of the dental schools, and a new generation of dentists imbued with the elementary principles of oral hygiene came into the general practice of their profession. The mechanical ideal was nevertheless still dominant, so that the inventive resourcefulness and manual craftsmanship of the dental profession was taxed to its limit in the creation of new mechanical devices for the repair and restoration of the damaged human masticating mechanism. It is quite true that during all this active development of elaborate dental prosthesis in the field of crown and bridge work, emphasis was placed upon the importance of so constructing this restorative mechanism that it should be ''self-cleansing''—that is to say, hygienic, and not in and of itself a cause of disease. The hygienic factor, however, was made to apply, in general, only to the mechanism itself, and not to the supporting tissues to which it was attached. Scant consideration was given to the hygiene of the abutments upon which elaborate and skilfully constructed dental restorations were permanently anchored.

Like lightning out of a clear sky, and at a time when dentistry was viewing with self-satisfied complacency the results of its skilled handicraft, Sir William Hunter, in October 1910, in a notable address before the faculty of medicine of McGill University of Montreal, arraigned the whole system of crown and bridge work as then practiced, in an indictment which again marked an epoch in dental progress. Subsequent investigation has demonstrated the soundness of the clinical investigations and the findings therefrom upon which was founded the indictment by Sir William Hunter of crown and bridge work as at that time practiced. Dental and medical scientific investigators as well as clinical observers in both professions have since confirmed the view that the infected root-canal is the prolific source of a variety of serious bodily maladies. Dental literature, and medical literature as well, is full of the records which establish beyond peradventure or doubt the constant menace to bodily integrity which an infected root-canal constitutes.

The medical profession has almost universally demanded that the dental profession eliminate this source of disease causation, and in its ignorance of the resources of dentistry has too frequently demanded that all teeth with non-vital pulps be extracted regardless of the usefulness of these teeth when freed of infection as members of the masticatory mechanism. Two important considerations arise in this connection with respect to the bearing which a sane solution of the problem has upon the public interest: First, it should be understood and borne in mind that the dentist is a specialist competently trained to form an intelligent opinion as to the best method of eliminating the chance of bodily infection from an infected root-canal; therefore the medical practitioner, who knows no more or even less about dentistry than he knows about special surgery, for example, has no more ethical right to order the extraction of a tooth without seeking the advice of a dentist than he has to order the enucleation of an eye without the advice of an oculist; and for him to act in such a case upon his own insufficient knowledge is merely to exhibit the courage of his ignorance to the detriment of the interests of his patient, and incidentally it is doing violence to the code of medical ethics.

Under the present highly specialized system of medical education it is as inconsistent to expect a medical man to be capable of giving an expert or even an intelligent opinion upon mouth conditions as it would be to seek from the dentist an expert judgment in a complicated obstetrical case.

But our present national emergency has created a situation which is rapidly bringing into professional and public prominence an incongruity of analogous character to that of the physician who dabbles in dentistry with no knowledge of the field. The Government of the United States is actively engaged in securing for national defense an army of, say, one million men. Each of these one million men must pass a physical examination by a medical officer relative to his physical fitness for military service. The medical officer is instructed by government regulation to accept men otherwise fit who have a specified number of opposable teeth in each jaw suitable for purposes of mastication. Concerning other and more serious matters of dental fitness the regulations are silent, and the medical inspector may presumably use his own discretion in regard thereto. We are therefore confronted with the incongruous situation that men who know little or nothing about mouth conditions are detailed by the government to pass judgment upon a matter of the most serious importance to the health and physical integrity of those engaged in the military service of the nation, about which they are, as a rule, profoundly ignorant.

Recent investigations made by dentists of the mouths of a limited number of enlisted troops show that practically all are in unhygienic condition, with an average of 6.17 open cavities per man and a large percentage of non-vital infected roots. Every mouth in such condition is a constant menace to the health of the individual. There is but one rational solution of the difficulty, and that is the assignment of the problem of oral and dental selection and care of recruits to dentists, who are best fitted for the work, and the removal of army and navy dental activities from medical men, who know little or nothing about the subject.

REVIEW OF CURRENT DENTAL LITERATURE

[*British Medical Journal*, April 14, 1917.]

Mouthwashes in Health and Disease. By HELEN P. GOODRICH.

This paper purports to be a record of certain observations *a propos* of the prophylaxis and treatment of pyorrhea alveolaris. The author gives a curious explanation of tartar formation, viz, the calcification of leptothrix threads. Further, she assigns to this cryptogam an etiologic rôle in the origin of pyorrhea. Consequently the question of the prophylaxis of this disease resolves itself into a search for agents destructive of the leptothrix buccalis. Optimistically she assures us that this ideal may be reached with a little trouble.

The experimental part of the paper concerns the action of certain liquids on the common organisms of the mouth. The test methods are outlined. The experiments were made in part with pure and mixed cultures of organisms from pyorrhea pockets, and contained, among other bacteria, streptococcus, pneumococcus, pneumobacillus, staphylococcus, and B. coli.

A saturated aqueous solution of thymol is a very good antiseptic for ordinary mouth bacteria, and it is the most satisfactory mouthwash that Dr. Goodrich has been able to find. It stimulates a flow of saliva. Boric acid gave disappointing results. A saturated solution must act for more than two minutes to be effective, and was not always satisfactory in five minutes. The author's views upon emetin hydrochlorid are emphatic and interesting. "Endamœba gingivalis is certainly not the cause of pyorrhea. . . . On several occasions I have kept E. gingivalis under observation in 1 per cent. and 0.5 per cent. solutions of emetin, and found specimens alive and putting out pseudopodia after twenty to forty minutes." She seems ignorant of the work of Smith and Barrett. Certainly her last observation is contrary to generally accepted views, whatever may be of truth in her opinion as to the significance of E. gingivalis.

Harmin hydrochlorid was tried, but its poisonous character alone would make it undesirable for general use in the mouth.

Iodin would obviously not make a satisfactory mouthwash for general use.

Hypochlorite solutions are not suitable for general use owing to their instability.

Toluene sodium sulfochloramid (chloranim-T.) which has given such good results when used in solution as a spray for the naso-pharynx of meningococcus carriers, was tested in 2 per cent. and 3 per cent. solutions. No growth occurred after submitting films of mouth bacteria to them for any time over fifteen seconds. However, the solutions have an unpleasant chlorinous taste, and this, in addition to the possible action on the teeth and their fillings, at present makes their general use undesirable.

Hydrogen dioxid solutions are too readily reduced to be successful in the hands of the ordinary patient. Potassium permanganate is by no means ideal, being only a weak antiseptic, and in addition to staining the teeth, has an unpleasant taste.

Zinc sulfocarbolate (zinc phenol parasulfonate) in 10 per cent. solution never once gave complete sterility (2.5 minutes).

The weakness of this paper lies in a few hasty generalizations, inserted at the beginning, which in reality have little or nothing to do with the main purpose of the study, and in a somewhat too obvious predilection for thymol. The value, at least the dental value, of this report is to be found in the rather extensive survey of chemical agents with respect to their possible applicability in the mouth.

[*American Journal of Physiology*, Baltimore, April 1, 1917.]

Changes in the Amount of Salivary Secretion Associated with Cerebral Lesions.

By K. S. Lashley.

This study of the marked salivation in various organic paralyses was undertaken with the hope that it might contribute something to our understanding of the cortical control of secretion. The secretion of the parotid gland alone was studied. Observations were made upon nine patients with more or less developed hemiparesis or hemiplegia. They included (1) tests of the volume of the secretion without stimulation, (2) tests of the reflex section to ordinary gustatory stimuli, (3) various attempts to induce inhibition of secretion, and (4) tests of possible conditioned or "psychic" reflexes. Brief case histories are included in this report, referring only to the pertinent features.

The average secretion of a single parotid gland in normal individuals varies from 0.5 to 8.0 cc. per hour, never more in any case which has been recorded. The secretion of the majority of the pathological subjects falls well within these limits. In two, perhaps three, of the nine patients tested there was, however, a secretion significantly above normal. Aside from the exaggerated secretion in the three subjects, the data on the rate of secretion without stimulation shows little abnormality. The differences in the quantities secreted by the two glands are, except in the three patients showing abnormal secretion, not greater than those found in normal men, and lie well within the possible error of the measurements. Where there was a marked difference in the quantity of saliva secreted from the right and left glands, the greater secretion in every case appeared on the side showing the more thorough involvement in the paralysis.

Tests were made of the reflex secretion of all the subjects to dilute acid and other gustatory stimuli, and of reflex inhibition by strong muscular effort. In all but four subjects these reactions seemed in every respect normal. The reflexes were prompt; inhibition of secretion occurred both during normal muscular activity and during attempts to move the paralyzed limbs, and the quantity of secretion obtained was proportional to the concentration of the stimulating solutions used (HCl from 0.2 per cent. to 5.0 per cent.). Further tests showed the normal relation of secretion to stimulation of the two sides of the tongue, unilateral stimulation exciting the gland of the same side to a greater extent than that of the other.

The abnormalities of secretion found in the four patients who did not respond normally may be summarized as follows:

J. H. Subnormal salivary reflexes on both sides, with greatly prolonged reaction time.

E. P. Exaggerated secretion in the absence of stimulation, with greater glandular activity on the side the musculature of which was involved in the paralysis (left), a higher threshold of excitability on this side than on the other, absence of differential reaction to stimulation of the two sides of the tongue for the left parotid, and, possibly, loss of conditioned reflexes on the left side.

P. M. Exaggerated secretion in the absence of stimulation, with inequality of the unstimulated secretion and of reflex secretion.

J. E. Prolonged reaction time with inequality of reflex secretion.

A point of some clinical interest seems to be that the drooling of saliva—unless excessive—is to be regarded as indicative of affection of the swallowing mechanism and accessory muscles rather than of heightened secretion.

The data at hand from these observations are scarcely extensive enough to justify any general conclusions as to the relation of the abnormal secretion to the other symptoms of motor paralysis. There seems to be no constant relation between the abnormal secretion and facial paralysis. The mechanism by which the heightened secretion is excited must be explained as the result of a continuous excitation of the glands.

[*Presse Medicale*, Paris, March 22, 1917.]

A Molar-Tooth Sign of Inherited Syphilis. By B. Sabouraud.

For five years Sabouraud has been studying a certain anomaly in the first maxillary molars, which he has found only in children and others giving a positive Wassermann test. Hence he regards it as a sign of inherited syphilis, and it often is the only sign to call attention to this condition. In the molars in question there seems to be a supernumerary cusp on the lingual surface of the tooth. It forms a protuberance more or less pronounced, and he has discovered it often when the teeth seemed otherwise free from syphilitic stigmata. He calls it the mammillary eminence of the lingual surface of the first maxillary molars, and relates instances in which it gave the clue to specific and effectual treatment. His illustrations show teeth with this rudimentary cusp, with views of normal teeth, and of the well-known types of other syphilitic dental anomalies.

In a series of twenty consecutive cases, the characteristic nature of this extra cusp was uniformly confirmed by a positive Wassermann test. In two cases the sign led to the discovery of syphilis as the cause of inveterate headaches, which yielded promptly to antisyphilitic treatment.

[*Journal of Criminal Law and Criminology*, Chicago, May 1917.]

Physical States of Criminal Women. By Alberta S. B. Guibord.

The material for this study was furnished by the inmates of the state reformatory at Bedford Mills, N. Y. Statistical data were tabulated in two separate groups of 100. It appeared that any consecutive 100 cases gave completely analogous results. The part which is of special dental interest is that which pertains to the oral conditions of these inmates.

About one-third of the population of this reformatory have good teeth, which have no abnormality other than is explicable on the ground of lack of care. Another third have teeth so poor as to force the conclusion that an unusually destructive process has been at work. The report nowhere specifically details the type of dental lesion or lesions found. About 21 per cent. show abnormality of shape and position of the teeth. Among the cases of "very poor" teeth a minimum of 6 per cent. showed unquestionable signs of congenital syphilis.

No attention apparently has been paid to variations in the form of the palate, which is so characteristic a feature of the physical stigmata of various types of the insane or weakminded. Also there is no suggestion of the relative frequency of impacted teeth, which condition is so often a concomitant of moral and anti-social vagaries. The defects in this report, which are so conspicuous from the dental standpoint, are perhaps inherent in the statistical method of approaching a problem. Studies of this kind, to be of paramount value to the dentist, must for the present, at least, limit themselves to the intensive analysis of concrete cases.

[*Indian Medical Gazette*, February 1917.]

Lumbar Puncture for the Relief of Teething. By T. Jackson.

There is reported here a case of a teething child, five months old, who presented fever with cerebro-spinal symptoms which could not be accounted for. Finally lumbar puncture was made, about 4 cc. of cerebro-spinal fluid was withdrawn and 2 cc. of physiological saline solution injected. Beyond being slightly blood-tinged, the cerebro-spinal fluid appeared to be normal, and proved to be sterile and otherwise normal on microscopical and cultural examination. On the following day the temperature became normal, and there was no return of the fever or convulsions. Jackson thinks it is not unreasonable to assume that the trouble was cerebro-spinal irritation due to teething, and that the withdrawal of a small amount of cerebro-spinal fluid in some way relieved the irritation, and consequently the symptoms.

[Bulletin No. 109, *Hygienic Library.*]

Pharmacological Studies with Cocain and Novocain. By George B. Roth.

The results of the laboratory experiments with cocain and novocain, when compared with results obtained in the clinical use of these substances, show that man is relatively more susceptible to cocain and novocain than are laboratory animals. From animal experiments it is seen that the toxicity of these substances depends partly upon the manner and method of administration. The statement also seems to hold true for man. Individual susceptibility is marked in both animals and man. In addition to idiosyncrasy, age seems to be in man a factor in the production of fatal results. In cases having low blood pressure or cardiac disease, novocain should be used with caution, inasmuch as in the laboratory experiments it has been shown to have a depressing effect upon the heart muscle when large doses are given.

The effects of novocain on the isolated heart of a frog resemble the effects produced by cocain, both substances causing a decrease in rate of the heart and a decrease in the extent of systole. The relative toxicity on the heart of the frog as determined by perfusion experiments is less for novocain than for cocain. Both cocain and novocain increase blood pressure and respiration in small doses, and depress in large doses.

[*Annali di Stomatologia*, Rome, March 1917.]

The Cytologic Character and Defensive Reaction of the Gingival Exudate. By Joseph Mendel.

The cytological character of the contents of the gingival trough differentiates itself from that of scrapings from the gingival or buccal surfaces and from the materia alba by the absence of epithelial cells and abundant bacterial clumps, and by the presence of a relatively constant leucocytic formula. The gingival trough is a veritable leucocytic sac, its exudate being in a state of permanent leucocytosis. Numerically the cells are grouped as follows: Polymorphonuclears, 90 to 95 per cent.; large mononuclears, 4 to 5 per cent.; small mononuclears, 3 to 5 per cent.; lymphocytes, 2 to 3 per cent. These figures are from normal gingival troughs.

In these studies Mendel has established two phenomena, (1) the great numerical constancy of the leucocytosis of the exudate in the normal state, and (2) the transition in the presence of a pathological condition from a leucocytosis to a state of hyper-leucocytosis more or less intense, which can terminate in a true suppuration.

Observations upon the phagocytic power of the cells of the gingival trough reveal that (1) in young normal individuals, there are 5 to 6 phagocytes per one hundred leucocytes; (2) with the appearance of hyper-leucocytosis the phagocytic ratio increases to a mean of 50 to 60 and up to even 80 per 100; (3) in well-marked pyorrhea alveolaris this ratio is rather low, 9, 10, 15, 16, 18, 23 per 100 leucocytes.

Generally the reaction is weaker when the suppuration is more abundant and the disease is more severe.

The removal of subgingival tartar not only does away with a mechanical irritant, but in the light of these studies actively stimulates a marked pericervical phagocytosis.

[*New York Medical Journal*, May 26, 1917.]

Report of Six Cases of Dysphagia and Dysphonia of Dental Origin. By Thomas J. Harris.

After a few introductory remarks upon oral foci of general infection, Harris reports six case histories illustrating "what to us is an altogether new manifestation of focal infection proceeding from the teeth."

In case 1 there was marked difficulty in deglutition, with great fatigue in talking. The throat showed no inflammatory condition. Radiographs revealed abscesses at the apices of several crowned teeth, which were extracted. Streptococci viridans were cultivated. Rapid improvement in swallowing took place, and in two weeks the difficulty in swallowing and speech had entirely disappeared.

The remaining five cases practically duplicate this first one.

In considering these cases in the light of many scattered throughout the literature, it does not seem an impossibility to regard the symptoms of dysphagia and dysphonia not as directly of an infectious nature, but as a manifestation of reflex nervous irritation proceeding from the diseased condition of the teeth. Harris excludes this idea from his consideration, but upon what grounds it does not appear.

He concludes with the most lamentable and unwarrantable statement that where a radiograph reveals an abscess, "We have yet to be convinced that any dentist can drain that abscess satisfactorily." The cases he reports are very interesting and deserving of the most careful consideration. It is unfortunate that he did not limit himself to this phase of the report.

[*Oesterreichische Zeitschrift f. Stomatologie,* Vienna, November 1916.]

Roentgenography of Mandibular Third Molars upon Oral Films. By Fritz Pordes.

Quite frequently, when it has been necessary to radiograph the distal end of the dental series, the mechanical conditions have called for the plate. In this contribution Pordes gives two simple hints which may permit the employment of a film in cases which otherwise would have demanded a plate.

(1) Where the mandibular third molar is in normal position, the film is creased along a line parallel to the shorter margin of the film, and at a distance of 1 or 1.5 cm. from the margin. The film is then folded upon itself along this crease so that the sensitive surface is directed buccally. The shorter segment of the film is then inserted between the teeth to be radiographed, and firmly held in place by bringing the jaws together. Then upon the larger segment the shadow can be projected.

(2) Where the tooth is impacted or tipped mesially, the film is creased along a line which may be defined as beginning at a point upon the longer margin of the film, 1 cm. from the shorter margin and running obliquely across the film to a point upon the opposite longer margin, 3 cm. from the shorter margin. When the film is folded at right angles along this crease, and when the smaller segment of the film is held between the teeth, the larger segment will tip distally, and thereby afford a sensitized surface upon which the dental structures can be projected. The lower angle of the film thus bent may be turned over upon itself, if necessary, to make it clear the floor of the mouth.

[*Dental Review*, Chicago, May 1917.]

The Pre-existing Lesions in the Oral Cavity and Their Relation to Malignant Diseases. By Joseph Colt Bloodgood.

Of the frequent papers on this topic, none other has been more impressive and convincing than this one. There are two parts to Bloodgood's report, (1) statistical, and (2) the illustrating of his contentions by reference to many concrete cases. It is exceedingly unfortunate that reproductions from his lantern slides could not have been incorporated in the printed form of his report.

The cases studied are reported in the surgical pathological laboratory of the Johns Hopkins Hospital. At first they were gathered only from the Johns Hopkins clinic, but later they were referred from many other sources, so their *ensemble* represents far more than the experience of one man. The total number of cases recorded in twenty-five years of lesions, either benign or malignant, in the oral cavity is 638.

When these cases are specifically studied the one factor that stands out predominantly is neglected teeth. In the great majority of cases, about 60 per cent., dentistry is conspicuous by its absence. Very few of these cases have really been supervised by a good dentist. This is very essential evidence to give us hope that the problem of cancer of the mouth is the problem of education of the public in regard to oral cleanliness and good dentistry. Bloodgood is so impressed that he emphasizes the statement, "Apparently it is as important to the health of the adult to keep the mouth clean and the teeth in good order as it is to the infant to be fed with clean pasteurized milk."

Of course, after caring for the mouth, the other rôle the dentist can play is that of recognizing the pre-existing lesions. Bloodgood uses this term as synonymous with "precancerous" lesions. For example, taking only the 117 cases of cancer upon the mucosa of gum, cheek, and hard palate, it appeared that 80 patients were warned by a pre-existing lesion of a definite character that anyone, no matter how ignorant, could be educated to appreciate. These pre-existing lesions were 25 warts, 12 warned by leucoplakia—white patches, 9 warned by definite tumors, 6 with unhealed sinuses, and 5 with scars from biting themselves. The lesion was present for months and sometimes for years before there was any change, this lesion being easily removable locally. Eighty out of 117 cases of cancer of the oral cavity could therefore have been cured by education in good dentistry. In only 31 cases was it of short duration, say 6 months or more. The problem of cancer of the mouth is not a problem of major surgery, but a problem of education.

[*Revista Odontologica Brazileira*, S. Paulo, November 1916.]

The Hypochlorites in Dentistry. By A. E. Hanson.

[*La Stomatologia*, Milan, December 1916.]

Hypochlorite of Calcium in the Treatment of Gangrene of the Pulp. By Benjamino de Vecchis.

The success of the Dakin-Carrel method of treating infected wounds has directed dental attention to the possibility of extending the principles of this method as a therapeutic medium in oral diseases. In the Cosmos for April 1917, p. 446, Barrett suggested the applicability of the Dakin-Carrel solution in the treatment of pyorrhea alveolaris. Hanson previously had claimed that for twenty years in clinical practice he constantly had employed the Labarraque solution for washing out the cavities in the teeth, and always with good results in the treatment of infected root-canals. "I have treated root-canals generally . . . with excellent results." In cases of gangrenous pulps or with suppurating root-canals, Hanson first washes them out with plain tepid water or a dilute solution of boric acid; then he employs hydrogen dioxid to oxidize the detritus, and finally completes the antisepsis with a modified Labarraque solution.

In the presence of an abscess a pledget of cotton saturated in this solution is placed in the cavity of the tooth, and a temporary filling of gutta-percha is inserted. This is left for forty-eight hours. Sometimes it is necessary to repeat the treatment, using tincture of iodin, alcohol, tricresol, formocresol or any other form of treatment when a fistulous tract, of long or short duration, exists. Then the first lavage with the dilute boric acid solution is given by means of a Pravaz syringe, passing then through the tract a ½ per cent. solution of hydrogen dioxid, and subsequently through the same tract the modified Labarraque solution. Rapid cures result, as much from the agent employed being an antiseptic as from the stimulating action on the tissues. The "modified Labarraque solution" spoken of above consists of Labarraque solution, 150 parts, aqua boricada, 100 parts. In some stubborn cases of chronic fistulæ, Javelle water, used alternately with the Labarraque solution, gives good results, due to the more stimulating effect of the potassium ions.

Apart from certain details of Hanson's method which are open to criticism, the fact remains that for a period of twenty years he has been using what is essentially a Dakin-Carrel solution with success in dental lesions.

The paper of De Vecchis must be an independent observation along the same line. The latter method is detailed as follows:

The pulp chamber or the radicular canals are widely opened. Therein is placed a pledget of cotton moistened with a saturated solution of calcium hypochlorite. The chamber or canals are wiped out with several successive changes of these pledgets until all odor of putrefaction has disappeared. The soft dentin is removed. A slightly moistened mass of the powdered hypochlorite is then placed in the depth of the cavity, which is sealed with gutta-percha. After three or four similar sittings the tooth is definitely ready for filling. The root-canals are obturated with gutta-percha points, and a base or step of cement is introduced before the metallic filling.

De Vecchis has followed this treatment for about one year. In that experience there has occurred no sign of apical irritation or peri-odontitis.

It is well to remember that the value of the hypochlorites and their modifications depends upon the liberation of chlorin. Therefore these methods are essentially identical with that of the electro-sterilization of root-canals.

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PERISCOPE

Cement for Mending Plaster Casts.—The following makes a reliable cement for mending broken plaster casts: Dissolve celluloid in acetone to a syrupy consistence. Smear the fractured surfaces and press together for a minute or two. It dries quickly and holds securely. Patches may be put in celluloid auto windows by moistening the surfaces with acetone and pressing together, leaving them transparent as before.—W. BUZZEL, *Dental Summary.*

Swaged vs. Cast Aluminum.—An aluminum base-plate for a full upper denture should be swaged rather than cast. There are several reasons, among which are the following: The swaged plate is lighter; the rim can be bent inward to get the advantage of the undercut of the alveolar ridge, and the heel of the plate can be bent upward to bring it into closer contact with the soft parts of the palatal surface of the mouth, while the cast plate is inflexible.—H. A. CROSS, *Dental Review.*

Treatment of Perforated Roots.—Where the root of a valuable front tooth has been the victim of crudely careless work and has been perforated in an attempt to open the root-canal, it can sometimes be saved by surgical interference through the gum and bone, and the insertion of an amalgam filling in the perforation.

The technique is practically the same as for apicoectomy. First locate approximately the perforation on the outside of the gum, then fill the canal as perfectly as possible before operating. A crescent incision is then made with its ends upward, forming a flap that when pushed upward will expose the opening in the root. Trim away the bone, and then insert an amalgam filling. Turn the flap back over the exposed part after thorough cleansing of the wound, and take as many stitches as are necessary. I have treated in this way a number of abscesses of several years' standing, and have saved teeth that in each case were well worth saving.—P. D. BROOKER, Columbia, S. C.

Pressure Anesthesia.—The field of operation must first be isolated. If the tooth is broken down so that a rubber dam cannot be placed on it, a copper band should be cemented to place. This will also be useful in keeping the solution from leaking under the pressure. After cleaning and sterilizing the cavity, place in it a pellet of cotton saturated with the solution. Then form a plug of base-plate gutta-percha the approximate form of the cavity, and stick it to a large-sized amalgam plugger; now moisten the end of the gutta-percha with the oil of cajuput and warm the end, but not the whole form. This softens the end of the gutta-percha so that it seals the periphery of the cavity, and the solution will not leak. A slow steady pressure for about a minute will insure results. Of course, if there is no exposure it may take a second application after exposing the pulp.

The indications for the use of pressure anesthesia are all cases where extirpation is necessary and there is no infection. If infection is present conductive anesthesia must be used. —L. E. BRYANT, *Dental Review.*

Damage Suits in Dentistry.—At the present time, in a number of cities, damage suits have been filed against dentists for the improper treatment of root-canals. This has been brought about, of course, by the present agitation in the medical and dental professions regarding the systemic effects of improperly filled root-canals. These damage suits have also been given impetus because of the different methods advocated for filling root-canals. These methods have been severely criticized by the profession's own members, and a great many men have been prone to criticize every method except their own favorite plan. Many men in the dental profession have unconsciously and unwisely made remarks in regard to the methods that have been employed by other operators, with the result that patients have taken those remarks to a lawyer, who has immediately begun a damage suit, which is a very disagreeable and unpleasant proposition to be compelled to defend, even if the suit is unjust and one which probably will be thrown out of court or decided in favor of the defendant when it comes to trial.—EDIT., *Internat. Journ. of Orthodontia.*

Fixed vs. Removable Appliances in Orthodontic Work.—In reviewing the progress in methods of treatment during the last few years, it is interesting to note that fixed appliances have in no way lost prestige, and in fact are now recognized almost universally by scientific orthodontists as the most rational and effective in our work.

So thoroughly has this been proved that we hear little controversy or argument from those who, for a time, were loud in their claims for removable appliances. The old saying that the proof of the pudding is in the eating applies with significance in this connection, for it has been proved that through the proper use of fixed appliances results can be obtained with a uniform degree of accuracy.

We all realize the great importance of being able to keep the force that is applied to moving teeth under absolute control at all times. If an appliance cannot be so constructed that we can maintain this control, it at once becomes a dangerous agent, relatively speaking.

Recent developments in orthodontic appliances make it possible for us to have more accurate control over applied force than we have ever had before, as well as making possible the application to the teeth to be moved of a degree of force which, in character, is best suited to effect physiological changes so much desired.—J. D. McCOY, *Internat. Journ. of Orthodontia.*

The Filling of Root-canals.—Over fifteen years ago we had an occasion to call the attention of the profession to the desirability of avoiding any irritation of the tissues beyond the end of the root-canal by either drugs or instrumentation, during the operation of removing the pulp or filling the root-canal. In fact, we made the statement then that it might be better to leave a small portion of the pulp at the apex rather than to go through the end with irritating drugs, broaches, or root-canal fillings. This teaching has been verified in the work of Carl G. Grove, Minneapolis, who states that there are fewer rarefied areas around the apices of the roots of teeth not filled to the end than around those which are filled to the end by the methods above described. We can see no reason for saying that drug or even mechanical irritation around the end of the root may be the sole cause of reinfection, because it has not yet been shown that gutta-percha will hermetically seal the end of a root; while, on the other hand, it has been shown by many experiments that gutta-percha will not act as a barrier to bacteria.—EDITORIAL, *Dominion Dental Journal.*

The Eye Signs of Nitrous Oxid Anesthesia.—In giving nitrous oxid-oxygen anesthesia the observance of the eye is of equal importance with the pulse, respiration, blood pressure, and color of the patient. In watching the eye we note, as the patient becomes unconscious, its continuous oscillation, the contraction of the pupil, and the lack of conjunctival anesthesia. The next change to be noted is the lack of oscillation of the eyeball and the presence of conjunctival anesthesia. The eye muscles relax, and the cornea is often seen in a dependent position. Here it is that the operation should be commenced. It is the loss of oscillation and the appearance of conjunctival anesthesia—because the two are synchronous—which should thus guide us. If anesthesia is deepened the pupil will dilate. If anesthesia is lightened and the pupil still remains dilated and the eyeball oscillates, we have then a condition of shock which will show an oscillating eyeball with a dilated pupil. The operative work should then be temporarily suspended. Before asphyxia occurs to any great extent you will notice that oscillation of the eyeballs ceases, and I think it unquestionably gives us reliable information.

As the zone of operative anesthesia in nitrous oxid is but fleeting and narrow, I offer this sign of the non-oscillating anesthetic eyeball as the most reliable guide in its administration.—A. H. O'NEAL, *Amer. Journ. of Surgery.*

Polishing Children's Teeth.—The permanent teeth in childhood are always rough, and if this roughness be not worn away by mastication and by the friction of hard fibrous food passing over them, they furnish ideal surfaces for collection of deposits, particles of food, plaques, etc., in the adult, making it hard to cleanse his mouth himself; in fact, the harder he brushes the more will he irritate his gums, brushing them over such rough surfaces. When such a case presents for treatment, all deposits are removed, and the rough surfaces are planed and polished perfectly smooth. This naturally cannot be done in one or two treatments, but extends over a long period of time. There are certain places so rough, perhaps, that they will need careful grinding before polishing. These rough spots are caused by irregularity of tooth structure. We all know how the enamel is composed of enamel rods cemented together, running perpendicular to the surface. In various ways the cementing substance is worn away, and the weakened ends of the rods in one particular spot break off. This leaves a roughened pit in the enamel which harbors tiny particles of food, plaques, bacteria, etc., and must be eliminated by grinding smooth, because such places are sources of irritation and acid formation, and tend to decay.—H. C. HARTWIG, *Internat. Journ. of Orthodontia.*

Benefits from Oral Prophylaxis.—In my own experience and that of others in the practice of oral prophylaxis certain definite results have been obtained. We find that prophylaxis does prevent caries of the teeth, gingivitis, and periodontoclasia, and will cure most cases of periodontoclasia in which destruction of tissues is not too far advanced. It checks erosion and lessens sensitivity of the teeth, especially in the cervical area, and also lessens sensitivity of the gums. It reduces inflammation of the soft tissues, and resistance to disease is increased by decreasing the number of bacteria in the mouth, thereby raising the vitality of its tissues. Putrefaction of all sorts of material formerly left in and around the teeth is eliminated, and with it bad breath; salivary secretions become normal, and digestive disturbances are much lessened, if not cured. The appearance of a tooth changes; it takes on a lifelike appearance, smoothness, and luster not seen in untreated teeth. The gums grow hard and firm, and assume that beautiful pink color which is the indication of health.

One most important result is the interest stimulated in the patient to take care of his teeth himself by educating him to a keen sense of uncleanliness in the mouth. He cannot know the difference between a clean mouth and a dirty one until after he has been under treatment for some time. My patients tell me they are actually uncomfortable after a dinner party because they cannot brush their teeth, so sensitive have they become to the presence of foreign matter in the mouth.—H. C. HARTWIG, *Internat. Journ. of Orthodontia.*

Waxing a Mesio-occluso-distal Inlay.—My technique in waxing a mesio-occluso-distal inlay is as follows: The first step is to force the softened wax into the cavity so that it fills-in the whole interproximal space. Trim off roughly most all the excess, with the exception of that filling in the interproximal space. Soften the wax with hot air on the occlusal and tell the patient to close the teeth. Re-trim the excess from the occlusal surface. Trim the wax lightly from the mesio- and disto-occlusal to the contact points, so that a very thin matrix can be placed between the excess wax and the adjoining tooth. Place one finger upon the wax and the matrix to steady them, and with a warmed burnisher—right and left burnishers are designed for the purpose—placed between the matrix and the adjoining tooth, force the matrix toward the gingival margin of the cavity, working it in and out so that the excess wax flows lingually and buccally and over the gingival margin. Do this first on the buccal, then on the lingual, and perhaps repeat on the buccal surface.

After finishing the distal side do the same on the mesial. Then flow a little soft wax on the mesial and disto-occlusal sides where it was cut away down to the contact point. Proceed to finish the other margin as you always have. Now, when the inlay is removed it cannot catch on the adjoining tooth surface and be disturbed. It will show the exact contact point, where a little hot wax may be dropped to compensate for polishing, or it may be left and a little 22-k. solder flowed in after the inlay is cast. If the wax should break away or pull away from a margin, never try to add hot wax over that point to restore it, but sink a hot flat burnisher into the wax about a millimeter from the defect, and press the thin softened wax toward the defective margin until it bulges out over the margin. Then flow your hot wax into the crevice thus produced. It does not take as long to do this as to tell about it, and once this technique is fully mastered it is very simple and accurate.—R. OTTOLENGUI, *Dental Items of Interest.*

OBITUARY

Dr. Frank Holland.

[SEE FRONTISPIECE.]

DIED, May 7, 1917, at his home in Atlanta, Ga., after an illness of several months, in his sixty-first year, FRANK HOLLAND, M.D.

Dr. Holland was born at Mount Prairie, Anderson county, Texas, November 9, 1856, the son of Dr. Sid G. and Mary A. Holland, his family moving to Augusta, Ga., when he was only six years of age.

He received his early education in the public schools of Georgia and at Mercer University, then located at Penfield, Ga. In the year 1879 Dr. Holland was graduated from the Atlanta Medical College, receiving the degree of M.D., and a few years thereafter associated himself in the practice of dentistry with his father, the late Dr. Sid G. Holland, in Atlanta, Ga., where they practiced together until the death of his father in 1904. Dr. Holland soon became one of the foremost dentists of the South, and was for twenty-six years professor of operative dentistry in the Southern Dental College, during which time he gained a national reputation as a dental operator. He justly enjoyed the reputation of being the best cohesive gold operator in the South, and on many occasions gave demonstrations of his skill in this branch of dentistry at clinics before the various dental societies of the country.

Dr. Holland was a member of the Georgia State Dental Society, serving the society as president in 1905; member of the National Dental Association, being its vice-president from the South in 1905; member of the Southern Branch of the National Dental Association; honorary vice-president of the Fourth International Dental Congress in 1904; member of the committee of the National Dental Association for the organization of the Third International Dental Congress, held in Paris, France, in 1900; and was honorary member of almost all the state dental societies of the South.

Dr. Holland was married November 24, 1885, to Miss Lilla Cope, of Savannah, Ga., who, with a son and a daughter, survives him.

The funeral services were held on Wednesday, May 9th, the interment taking place in the West View Cemetery, Atlanta, Ga.

Eulogium.

"Not the torn sails and scarrèd hull
Of the ship which reaches port at end of day
Shall be condemned
Until it has been asked: Where has she been?
Sailed she through calm or storm? How long her way
To harbor at the end?"

ON May 7, 1917, there left an emaciated frame the bravest soul that ever took its flight from a human body—FRANK HOLLAND. What a name to characterize his personality! Frank he was, to everyone, friend or fellow. He had no secrets; there were no dykes about this Holland. He was the most approachable man I knew, and the kindest to those of scant acquaintance; but that is as nothing to those who knew and loved him, and the short time between the "fellow" and affectionate regard was unappreciable. "Dr. Frank" they soon called him.

Those who stand on the shore or wharf and see their friends depart—their emotions are not to be written. How high their hopes, with what confidence their hands are waved in the last sight, is an incident, but what they feel cannot be said. The voyage cannot be measured. "Outward bound" has little significance for us who stand alone or turn to weep and pray God for a safe passage.

When Dr. Holland was first taken sick and went to the mountains of New York to try to restore his health there was a wave of sympathy that seemed to send a shock throughout the country. Wherever there was a social or professional gathering of dentists, warm compliments and expressions of appreciation—

aye, affection—were made. Many made pilgrimages to Saranac to give him cheer; to these, in spite of their right to know, he would seldom complain, and when ill would not write his friends. Often he would say: "If I have any good news I am glad to share it with those I love, but I will not burden others with my misfortunes."

Frank did not know what selfishness was; he always wanted to play the host, and his lavishness when such opportunities presented often embarrassed those who knew him best and loved him most; but in this he would have his way. In fact, suave gentleman that he always was, he was in no sense a milksop; he had his opinions and defended them to the limit. Perhaps it might be said that the burden of his contentions to his professional associates was that there were too few gentlemen practicing dentistry; that social graces and refined and cultured training should at any cost be cultivated. He was no braggart, but the thing he admired he really was. He held his own with grace and poise in any company. The nicest and most refined people were attached to him and grew to be his fast friends. Not only was he appreciated for his social graces, but he was easily the Marshall Webb in operative dentistry of the South. He was a pupil of Dr. Webb, and in fact sought instruction from all the brilliant operators of this country. I have often wondered at the boldness with which he mapped out his clinics; he did not spare himself, but went at his work with true pride and confidence in his ability; and invariably he turned out a gem. I think the most touching tribute I have ever witnessed was paid Dr. Holland in Atlanta by the Southern Study Class, with clinicians from all over. They tendered him a banquet a little time before he died. He was not able to attend, but I did, and never have I heard so many nice things said of anyone; unblushingly everyone spoke his worth and proclaimed their love for him. How much he appreciated this may be known by a quotation from a letter. He said:

> "If you could look into the innermost recesses of my heart at this time and see how each pulsation is freighted with deepest appreciation and tender affection, then you would know how this token of your friendship touches me. I do not often feel called upon to unbosom myself, but gratitude, when honest, is potent, and must speak its sentiments of love when the heart is full to overflowing."

The rare quality of making friends and being true to them he had:

> "There is one thing in human nature that is refreshing as water to the thirsty soul, or as light to the eyes that for weeks have known nothing but darkness. There is one thing in human nature which makes the whole world kin. I mean that sweet and blessed and mysterious gift and grace of our nature which we call friendship."

He loved and was loved, but he would not be pitied. As nearly as I, who thought myself his best friend and confidant, could estimate, this was his attitude of mind:

"When I have finished with this episode,
Left the hard, uphill road,
And gone weird ways to seek another load,
Oh, friends, regret me not, nor weep for me,
Child of Infinity!"

B. Holly Smith.

A Tribute to William H. Towne.

My first acquaintance with "Billy" Towne, as he was lovingly called by his friends, began in the middle sixties in Boston, Mass., at the branch office of the S. S. White Dental Mfg. Co., as now called. It was my misfortune to be burned out twice in six weeks, and he served me in selecting my outfits, the house cutting my last bill in two.

Many years ago we made a pact that, whichever died first, the survivor should say a kind word of the other; so it remains for me to "make good," though others could the better do him justice. First, he was a man in all that the word implies. He believed in the house of S. S. White, and their goods, and was always loyal to their interests. He was a man of remarkable attainments, cordial in his manner, with a kind, cheery face beaming with smiles and with a twinkle in his eye such as is rarely seen. He was well posted in the details of clerkship, and later he became traveling representative of the Company—in fact, the pioneer in this departure.

Who in New England did not know "Billy"

Towne? By nature and inheritance a poet, none knew his Shakespeare better than he, nor was more fond of quoting him, and his recitations are long to be remembered. He was a mystic by nature, a philosopher, and religious in his beliefs; a hypnotist of marvelous powers, and wisely devoted to the cure of disease, the uplift of humanity, and the curing of bad habits in the young. For a period of five or more years he retired from business, withdrew from the world of commerce, and joined some order of perfectionists—returning later to his work with a broader view of life and its possibilities.

He was a natural orator, commanding the attention of and inspiring his hearers to a high plane of goodness and greatness—to the nobleness of right living and acting. He was often called upon at dental conventions to respond for the trade; then surprise came upon all, for the commercial was ignored, and the ethics of professional life and service became the high theme of his talk, which often surpassed the efforts of any other speaker.

As an entertainer he was without a peer. Once, and only once, did I meet him away from business, at a summer resort on the Maine coast. It was his delight to entertain the visitors there with recitations, and, drawing from his full experiences of life, answering their many questions with wonderful grace and logic, always bringing out the pleasant side of life, full of optimism, encouragement, and uplift. He was easily the leader among the traveling men, who as a class are in high renown. He had a keen sense of humor, and his hearty laugh did one good; to meet him and talk with him made one a better man. We all shall miss his hearty congratulations, his kind comments, his cheering words, his good advice, especially to the young man just entering the temple. He will be missed by all who knew him, and by none more than his life-long friend and admirer,

C. H. Gerrish.

Exeter, N. H.

[Mr. Towne was born April 14, 1840, and died April 26, 1917, from acute indigestion. He became associated with S. S. White in 1854. After sixteen years' service he left the firm, returning, however, in 1884, and remaining with the Company until his retirement in February 1913.—Ed.]

"In Memoriam" Resolutions.

Dr. Arthur Holbrook.

The following resolutions on the death of Dr. Arthur Holbrook were passed by the Milwaukee County Dental Society, at a meeting held February 21, 1917:

Whereas, death has taken from us Dr. Arthur Holbrook, for many years dean of the dental profession in Wisconsin, and a life member of this society, a brief sketch of whose life was published in the May 1917 issue of the Dental Cosmos; therefore be it

Resolved, That we mourn the loss of a faithful friend and most helpful professional associate, one whose life has been of great service to the public and a potent force in the advancement of dentistry; and be it

Resolved, That while we mourn his loss, yet we rejoice in the distinguished success which he attained through adherence to the highest professional standards, and that his life is an inspiration and encouragement to us all; and be it

Resolved, That these resolutions, together with the sketch of Dr. Holbrook's life, be made part of the permanent record of this society, and that copies be sent to the Dental Cosmos and to such other journals as might desire to publish them; and be it further

Resolved, That a copy of these resolutions be sent to Dr. Holbrook's family.

Chas. L. Babcock,
C. W. Hall,
H. M. Uebele,
Committee.

Dr. W. W. Thompson.

The Second District Dental Society of the State of New York passed the following "in memoriam" on the death of Dr. Winthrop W. Thompson:

It is with the deepest regret that we, the members of the Second District Dental Society, record the passing away, on February 16, 1917, of our brother, Dr. Winthrop W. Thompson, in the forty-fifth year of his life.

Serving as vice-president, on many committees, and as treasurer for six years, he gave unselfishly of his time, and was constantly working for the success of the society. Therefore be it

Resolved, That our sympathy is hereby extended to the wife and family of Dr. Thompson, and it is directed that this our tribute be spread upon the minutes of the society.

P. F. Wolf,
W. S. Watson,
Committee.

DENTAL COLLEGE COMMENCEMENTS

State Dental College (Texas).

THE twelfth annual commencement exercises of the State Dental College were held in Dallas, Texas, on May 14, 1917.

Addresses were delivered by Chas. Hatcher and Dr. Ivan Lee Holt.

The degree of Doctor of Dental Surgery was conferred by Dr. Bush Jones, dean, on the following graduates:

Herbert E. Arvin
Charles H. Beseda
Joseph B. Brandon
Malcom H. Brannen
Mathew D. Burnett
Walter E. Chaney
William E. Corbin
Samuel L. Cox
Robert L. Delafield
Orla M. Durham
Wyatt H. Gilbert
Walter A. Grouws
John C. Hardin
Charles L. Hatcher
William S. Hughes
Frank E. McCreary
Jacques S. McMinn
James B. Mann
Ruel E. Middick
James U. Moody
William S. Poe
Adolph A. Pollock
John W. Reames
Charles A. Reitch
Joseph V. Siegmund
Lorenzo L. Skaggs
Ed Taylor
Grover C. Turner
Juanita Wade
Charles B. Walls
W. Clarence Walls
James E. Witt
Clyde W. Yetter

Atlanta Dental College.

THE annual commencement exercises of the Atlanta Dental College were held on May 30, 1917, in Atlanta, Ga.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Lester W. Benbow	North Carolina
Albert T. Bevill	Louisiana
Joe E. Bond	Arkansas
Theodore G. Boyd	Texas
Norman E. Boylston	South Carolina
Thomas Crenshaw, Jr.	Georgia
Edward A. Crudgington	Tennessee
Frank A. Daniel	Louisiana
Charles D. Dawkins	North Carolina
Thomas D. Dennison	Georgia
Rene A. Diaz	Florida
Daniel E. Dugger	Alabama
James H. Ellerbe	North Carolina
Sigma J. Finch	North Carolina
William R. Fisher	North Carolina
Laurens W. Fort	South Carolina
Edward E. Foster	B. W. Indies
Judge W. Fowler	Georgia
George E. Fussell	Georgia
Josiah B. Game, Jr.	Florida
Pinkney T. Garrison	North Carolina
Wade W. Geiger	Florida
Grosvenor McK. Goad	Virginia
J. Lyford Gray	Georgia
Aaron S. Harding	North Carolina
Flavius J. Hearn	Louisiana
Oma H. Hester	North Carolina
Lyman J. Hooper	North Carolina
John H. Hughes	North Carolina
Harold P. Ingram	Florida
Roscoe C. Jennings	Virginia
Paul W. Key	Georgia
Robert E. Latta	North Carolina
Leslie T. Ludwig	Florida
Robert L. McConnell	Virginia
James V. McCoy	Mississippi
Graham McLean	North Carolina
Loy J. Moore	North Carolina
Alexander W. Nance	North Carolina
James M. Nesbit	South Carolina
John S. Plaxco	Georgia
Hugh B. Prater	Tennessee
Wade C. Raymer	North Carolina
Olliver J. Shaffer	Texas
John M. Sheridan	New Hampshire
Riley E. Spoon	North Carolina
Floyd N. Tomlinson	North Carolina
Arthur B. Tramel	Louisiana
Hubbard C. Turner	Georgia
Roland D. Tuttle	North Carolina
Tillie D. Vinson	Georgia
Perry H. Walet	Louisiana
Clifton L. Wall	Mississippi
Aaron Walters	Oklahoma
W. Stakely Weaver	North Carolina
William R. Wilkins	Texas
William F. Willcox	Georgia
Homer A. Wimberly	Texas
James W. Young	Georgia

Texas Dental College.

The annual commencement exercises of Texas Dental College were held on May 17, 1917, in Houston, Texas.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

C. A. Davis	Texas
A. T. Devall	Texas
R. C. Edwards	Texas
R. A. Graves	Texas
L. Harris	Texas
M. E. Mallett	Texas
J. W. Outlaw	Texas
A. J. Overton	Texas
Wm. M. Ray	Texas

University of Tennessee, College of Dentistry.

At the annual commencement exercises of the University of Tennessee, College of Dentistry, held on June 6, 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

D. T. Black	Arkansas
R. P. Brooks	Tennessee
J. J. Burns	Mississippi
J. L. Grover	Arkansas
J. H. Houston	Texas
C. H. Nash	Tennessee
R. W. Street	Mississippi
C. C. Smith	Arkansas
J. M. Williams	Arkansas

Loyola University, School of Dentistry.

At the annual commencement exercises of Loyola University, School of Dentistry, New Orleans, La., held June 18, 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Charles A. Adolph	Louisiana
James J. Arroyo	Louisiana
Albin P. Dansereau	Louisiana
Jose R. Ferro y Castro	Cuba
Ben B. Matthews	Louisiana
Felipe Pieraldi y Cedeno	Porto Rico
Guillermo L. Selles y Smith	Panama
Jesse E. St. Amant	Louisiana
Anton C. Tranchina	Louisiana

Marquette University, School of Dentistry.

At the commencement exercises of Marquette University, School of Dentistry, held in Milwaukee, Wis., June 12, 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Lyle P. Ambelang
Francis Barzak
E. L. Berger
Robt. Brooks
Ernest Borthwick
Albert J. Butler
E. W. Chamberlain
Merton Chesley
Otto J. Cole
G. Cunningham
Harvey Crosby
Lawrence Cubela
Dennis De Munck
James Devine
Stephen Donovan
Anthony Dontie
John A. Droegkamp
Melvin R. Eiche
Earl C. Elfert
Henry J. Etteldorf
John T. Evans
Floyd F. Field
Harry H. Flannery
Leo Flatley
Norman G. Gary
Neil Geary
Earl G. Gebhardt
Elmer W. Goeltz
David M. Goodsett
Elmer F. Gotsche
Edwin P. Grady
Wade Harrington
Walter C. Hauser
Fred Kostlevy
Sidney Kurth
Paul E. Lanzer
Harry E. Lando
Vivienne Leichtnam
Harry D. Lewis
C. R. Lohneis
Robert W. Loux
Gustave L. Martin
Myron H. Moen
Walter Monroe
John E. Olson
Leon L. Parks
Earl C. Parrott
Eugene Pawinski
Harry G. Rahn
Clarence M. Ruchti
Donald L. Russell
H. A. Schefelker
Wm. A. Schlei
Alvin G. Schmidt
Thos. A. Skowlund
John J. Stattery
Geo. B. Speaker
Earl E. Stevens
Avery Sutherland
Lawrence De Selle
John G. Timmermier
Alvin B. Ward
Alvin Wiebrecht
Roy E. Wheeler
John M. Wolters
John H. Young
F. H. Younglove

SPECIAL NOTICES.

Preparedness League of American Dentists.

Headquarters—3 Professional Building, 131 Allen St., Buffalo, N. Y.

IMPORTANT NOTICE.

At a joint meeting of the Ad Interim Committee of the National Dental Association and the Advisory Committee of the Preparedness League of American Dentists, held in Buffalo, April 26, 1917, a resolution was passed establishing an Advisory Committee composed of the present Officers, Advisory Board, Board of Trustees, and the Ad Interim Committee of the National Dental Association. Action was taken confirming the permanent organization of the League as approved by the National Dental Association. It was also decided that the entrance fee to the League —$1.00—would continue in force.

ADVISORY COMMITTEE.

J. W. Beach	N. Y.	F. M. Casto	Ohio.	J. D. Millikin	Calif.
H. J. Burkhart	N. Y.	T. P. Hinman	Georgia.	A. W. Viney	Calif.
M. B. Eshleman	N. Y.	O. U. King	Indiana.	C. J. Lyon	Mich.
F. W. Low	N. Y.	T. W. Brophy	Illinois.	H. E. Friesell	Pa.
H. A. Pullen	N. Y.	W. H. G. Logan	Illinois.	E. C. Kirk	Pa.
H. L. Wheeler	N. Y.	G. N. West	Illinois.	J. V. Conzett	Iowa.
L. L. Barber	Ohio.	T. B. Hartzell	Minn.	B. H. Smith	Md.
S. D. Boak	Ohio.	T. W. Hergert	Wash.	F. T. Murlless	Conn.
H. C. Brown	Ohio.	F. O. Hetrick	Kansas.	M. F. Finley	D. C.

INFORMATION RELATING TO APPOINTMENTS IN

THE DENTAL RESERVE CORPS OF THE ARMY.

The National Defense Act of June 3, 1916, and the tentative regulations thereunder, provide for a dental section or branch of the Officers' Reserve Corps. The officers of the Dental Reserve Corps have the rank of first lieutenant, and are appointed and commissioned by the President, after having been found, upon examination prescribed by him, physically, mentally, and morally qualified to hold such commissions. Commissions are issued for periods of five years, at the end of which time the officers may be recommissioned, subject to such further examinations and qualifications as the President may prescribe. They are subject to call for duty in time of actual or threatened hostilities only. While on active duty under such call they are entitled to the pay and allowances (including quarters, fuel, and light) of their grade. They are entitled also to pension for disability incurred in the line of duty and while in active service. They are not entitled to pay or allowances except when in active service, nor to retirement or retired pay.

Appointees must be citizens of the United States, between twenty-one and fifty-five years of age, must be graduates of standard dental colleges, and must, at the time of appointment, be in the active practice of their profession in the states in which they reside.

The examination is physical and professional. It is conducted by boards consisting in each case of one medical and two dental officers in the Army, designated by the War Department.

The examination as to physical qualifications conforms to the standard required of recruits for the United States Army. Defects of vision resulting from errors of refraction which are not excessive, and which may be entirely corrected by glasses, do not disqualify unless they are due to or are accompanied by organic disease. Minor physical deficiencies may be waived.

The professional examination will be oral. If the applicant fails therein, he may, if he desires, have a written examination. An average of 75 per cent. is required to qualify in the examination. The examination comprises the following subjects:

(1) Dental pathology and bacteriology.
(2) Chemistry, physics, and metallurgy.
(3) Recent advances in dental surgery and technique.

Applications for appointment in the Dental Reserve Corps must be made in writing, upon the prescribed blank form, to the Surgeon-general of the Army, Washington, D. C., who will supply the blank upon request. The correctness of the statements made in the application must be sworn to by the applicant before a notary public or other official authorized by law to administer oaths. It must be accompanied by testimonials based upon personal acquaintance from at least two reputable persons as to the applicant's citizenship, character, and habits, and by his personal history given in full upon the blank form furnished him for the purpose.

SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS not later than the 11th or 12th of the month preceding that of publication.

Coming Dental Society Meetings.

JULY.

NEW JERSEY STATE DENTAL SOCIETY. Atlantic City. Three days: July 11th to 13th.

SEPTEMBER.

AMERICAN SOCIETY OF ORTHODONTISTS. Excelsior Springs, Mo. September 5th to 8th.

OCTOBER.

NATIONAL DENTAL ASSOCIATION. New York City. October 22d to 26th.

NATIONAL ASSOCIATION OF DENTAL FACULTIES. New York City. October 19th and 20th.

ASSOCIATION OF MILITARY DENTAL SURGEONS. New York City. October 23d to 26th.

Examiners' Meetings.

MAINE BOARD OF EXAMINERS. Augusta. July 12th to 14th.

MONTANA BOARD OF EXAMINERS. Helena. July 9th to 13th.

RHODE ISLAND BOARD OF EXAMINERS. Providence. July 5th to 7th.

National Mouth Hygiene Association.

DEPARTMENT OF EXTENSION LECTURES.

A COMPLETE lecture set, consisting of full manuscript and thirty-six specially selected and prepared lantern slides covering the subject of Mouth Hygiene, is furnished by this association to members of state dental societies and others who may be considered as qualified to present the subject on the lecture platform.

For rental and sale terms and other particulars address

EDWIN N. KENT,
Director of Extension Lectures,
330 Dartmouth st., Boston, Mass.

NATIONAL DENTAL ASSOCIATION ANNOUNCEMENTS

Twenty-first Annual Meeting, New York City, October 22-26, 1917.

To date the following reports have been received from the various section chairmen, committeemen, etc.

Partial Program.

SECTION I.

Chairman—Dr. E. D. Coolidge, 59 E. Madison st., Chicago, Ill.

"Some Neglected Operative Prerequisites." Dr. Fred E. Hart, San Francisco, Cal.

"Porcelain Inlays" (exact title not yet chosen). Dr. W. L. Fickes, Pittsburgh, Pa.

"Present Tendencies in Operative Dentistry." Dr. J. M. Walls, St. Paul, Minn.

Also an important paper dealing with the subject of Dental Education. (Essayist not selected as yet.)

SECTION II.

Chairman—Dr. F. B. Moorehead, People's Gas Bldg., Chicago, Ill.

Dr. Virgil Loeb of this committee reports that he has thus far accepted two essayists: Dr. Elmer S. Best, Minneapolis, Minn., on some phase of Root-canal Filling; and Dr. Howard R. Raper, Indianapolis, Ind., on "Misinterpretation of Radiographs."

SECTION III.

Chairman—Dr. L. E. Custer, 28 N. Ludlow st., Dayton, Ohio.

"Ionization, with Special Reference to Ionic Chemistry." Dr. Geo. T. Fette, Cincinnati, Ohio.

"The Chemical Action of Soil Bacteria on Calcium Phosphates, with the Chemical Analysis of the Human Teeth." Dr. J. E. Hinkins, Chicago, Ill.

"Why Measurements of the Mandible, Tracings of the Condyles, Construction of Hypothetical Triangles, and Use of the Face-bow, are All Non-essential to the Construction of Dentures Possessing the Highest Degree of Efficiency." Dr. D. D. Campbell, Kansas City, Mo.

(Subject to be announced later.) Dr. Calvin S. Case, Chicago, Ill.

Also two other papers, the titles of which will be announced later.

STATE SOCIETY OFFICER'S SECTION.

Chairman—Dr. John C. Forsyth, 430 E. State st., Trenton, N. J.

First session. "Some Phases of Postgraduate Work." Dr. B. L. Shobe, Tulsa, Okla.

"Securing Some Satisfactory Legislation." Dr. Alexander H. Reynolds, Philadelphia, Pa.

Second session. This will be devoted to six or seven short papers of five to ten minutes each by men of different state societies, telling of some outstanding feature of their own society's work that is thought to be of the greatest importance; or, if the essayist prefers, he may present the weak part of the work and ask for helpful suggestions. These papers are to be followed by a general discussion which it is hoped will bring out some very valuable points. (The essayists for this session have not as yet been secured.)

COMMITTEE ON ANESTHETICS.

The secretary of this committee, Dr. Chalmers J. Lyons, of Ann Arbor, Mich., reports as follows:

"The Teaching of Conductive Anesthesia." Dr. Theodor Blum, New York City.

"After-Pain in Local and General Anesthesia." Dr. A. E. Hertzler, Kansas City, Mo.

"The Toxicity of Local Anesthetics." Dr. Geo. B. Roth, Washington, D. C.

COMMITTEE ON ENTERTAINMENT.

At a recent meeting of this committee a Ladies' Auxiliary was organized, of which Mrs. Dr. M. L. Rhein was made chief officer, and Mrs. Dr. Henry W. Gillett, 140 W. 57th st., New York City, secretary. It would greatly facilitate the endeavors of the Ladies' Auxiliary to add as much as possible to the pleasures and comforts of the visiting ladies, if those who intend to come to New York would notify Mrs. Gillett, stating, if possible, the hotel at which they will be registered.

Publicity Committee,
R. OTTOLENGUI, *Chairman.*

Railroad Rates.

THE Trunk lines and the New England and Central passenger associations have granted a rate of two cents per mile in each direction, going and returning via the same route only, limited to midnight of October 30th.

Going tickets in Trunk line territory will be on sale October 19th, 20th, 21st, at the one-way fares, on the certificate plan, these certificates to be indorsed by general secretary, Otto U. King, and to be validated by the special agent of the railroads, who will be in attendance on October 24th, 25th, 26th. Return tickets to be sold on presentation of validated certificates, October 24th to 29th, at the difference between the fares paid on the going trip and the fares for the round trip. Return limited to continuous passage to destination, and not later than October 30th. This applies on tickets with a minimum of $1.00 for round trip.

New England passenger association tickets to be sold or certificates issued and good going October 19th, 20th, and 21st and returning not later than October 30th. Two cents per mile each direction, shore line mileage, going and returning via the same route only.

Central passenger association territory round trip tickets, requiring validation in New York City, will be sold on October 19th, 20th, and 21st, with a final return on October 30th. Two cents per mile in each direction.

There will be no fee for validation.

Committee on Transportation,
D. C. BACON, *Chairman.*

Association of Military Dental Surgeons.

THE annual meeting of the Association of Military Dental Surgeons of the United States will be held at Hotel Astor, New York City, October 23 to 26, 1917.

J. D. MILLIKIN, *President,*
S. W. HUSSEY, *Sec'y.*

National Association of Dental Faculties.

THE 1917 meeting of the National Association of Dental Faculties will be held at the Astor Hotel, New York City, Friday and Saturday, October 19 and 20, 1917.

The Executive Committee will meet at 9 A.M., and the general session will open at 10 o'clock as usual.

CHAS. CHANNING ALLEN, *Sec'y,*
N W. cor. 10th and Troost, Kansas City, Mo.

American Society of Orthodontists.

THE annual meeting of the American Society of Orthodontists will be held at Excelsior Springs, Mo.—thirty minutes' ride from Kansas City—September 5, 6, 7, and 8, 1917.

The program will be one of the best ever presented by the society. All those interested in orthodontia are invited to attend.

F. M. CASTO, *Sec'y,*
Cleveland, Ohio.

Forsyth Dental Infirmary for Children.

NEW DEPARTMENT—LIBRARY AND MUSEUM.

THE trustees and director of the Forsyth Dental Infirmary for Children have authorized the creation of a new department, to be known as the "Library and Museum." They solicit from the dental profession contributions of books and dental periodicals, particularly those out of print and not readily obtainable by purchase; also specimens of dental abnormalities, casts, or specimens of unusual structures of dental interest, for all of which permanent acknowledgment will be given.

FREDERICK A. KEYES, D.M.D.,
Librarian and Curator of Museum.

New Jersey State Dental Society.

The forty-seventh annual convention of the New Jersey State Dental Society will be held at Atlantic City, N. J., on July 11, 12, and 13. 1917.

The entire convention will be held on Young's Million Dollar Pier. Machinery Hall will be used for the exhibits. Dr. George W. Wakeley of Orange, N. J., is chairman of the committee, and with 25,000 square feet of space available expects to have the greatest display of dental goods in the history of the society. Machinery Hall extension, with about 10,000 square feet of space, will give ample room for clinics and meetings.

Dr. Charles A. Spahn of Newark, N. J., is chairman of the Clinic Committee, and will present some entirely new clinics. Dr. Raymonde A. Albray of Newark, N. J., chairman of the Essay Committee, has arranged for essayists of prominence.

The headquarters of the society will be on the pier, and mail may be directed to exhibitors, clinicians, or members in care of the secretary of the New Jersey State Dental Society, Young's Million Dollar Pier, Atlantic City, N. J. A list of hotels where special rates may be secured will be published in the *Journal*, and mailed prior to the convention.

A cordial invitation is extended to ethical practitioners.

John C. Forsyth, *Sec'y,*
430 E. State st., Trenton, N. J.

Illinois State Dental Society.

The fifty-third annual meeting of the Illinois State Dental Society was held in Quincy, May 8 to 11, 1917.

An invitation was extended to the National Dental Association to meet in Illinois in 1918.

The next annual meeting of the state society was not determined, but will be announced later.

The following officers were elected: J. E. Hinkins, Chicago, president; W. L. King, Quincy, vice-president; J. P. Luthringer, Peoria, secretary; L. B. Torrence, Chester, treasurer; G. H. Henderson, Chicago, librarian.

J. P. Luthringer, *Sec'y,*
Peoria, Ill.

New York State Board of Examiners.

The State Board of Dental Examiners announce the following dates for dental licensing examinations in New York State for 1917 and 1918:

1917—June 26–30, inclusive; October 2–6, inclusive (New York City, Albany, and Buffalo).

1918—January 29–February 2, inclusive; June 25–29; September 24–28, inclusive (New York City, Albany, and Buffalo).

M. J. Terry, *Sec'y,*
Albany, N. Y.

Rhode Island Board of Registration.

The Rhode Island Board of Dental Examiners will hold its next examinations on July 5, 6, and 7, 1917, in the State-house, in Providence.

For further information address

Ernest A. Charbonnel, *Sec'y,*
139 Mathewson st., Providence, R. I.

Maine Board of Examiners.

The Maine Board of Dental Examiners will hold its only meeting of the year in the State Capitol, July 12, 13, and 14, 1917.

Will S. Payson, *Sec'y.*
Castine, Me.

Montana Board of Examiners.

The Montana State Board of Dental Examiners will hold their next session for examination on July 9, 10, 11, 12, and 13, 1917, in Helena, Mont. Applications must be in the hands of the secretary ten days before the 1st of July.

For information, inquire of

G. A. Chevigny, *Sec'y,*
107 Clark Block, Butte, Mont.

Examination of Dentists for the U. S. Army.

The Surgeon-general of the Army announces that examinations for appointment in the Dental Corps of the Army will be held at Fort Slocum, N. Y.; Columbus Barracks, Ohio; Jefferson Barracks, Mo.; Fort Logan, Colo., and Fort McDowell, Cal., on Monday, July 2, 1917.

Application blanks and full information concerning these examinations can be procured by addressing the Surgeon-general U. S. Army, Washington, D. C.

The essential requirements to securing an invitation are that the applicant shall be a citizen of the United States, shall be between twenty-one and thirty-two years of age, a graduate of a dental school legally authorized to confer the degree of D.D.S., and shall be of good moral character and habits.

Successful applicants will be immediately appointed—as far as the number of vacancies will permit—to the grade of first lieutenant, at an entrance salary of $2,000 per annum.

In order to perfect all necessary arrangements for the examination, applications must be in the possession of the Surgeon-general at least two weeks before the date of examination; early attention is therefore enjoined upon all intending applicants. There are at present fourteen vacancies to be filled, and on July 1, 1917, there will be twenty-two additional vacancies.

United States Patents

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING MAY 1917.

May 1.

No. 1,224,195, to Edwin Mountford. Artificial tooth.

No. 1,224,203, to Felix A. Patten. Belt.

No. 1,224,395, to William T. Lyon. Dental engine.

No. 1,224,490, to Edwin Mountford. Tooth-mold.

No. 1,224,687, to Samuel W. Taliafero. Mold for making dental crown dies.

No. 1,224,696, to John D. Wise. Toothbrush holder.

No. 1,224,740, to John C. Green. Toothbrush.

May 8.

No. 1,225,230, to George N. Elwin. Toothbrush.

No. 1,225,362, to William M. Ruthrauff. Dentifrice.

May 15.

No. 1,225,955, to John Hickman. Toothbrush.

No. 1,226,231, to James E. Mack. Toothbrush holder.

No. 1,226,232, to Joseph E. Mahan. Dental cement.

No. 1,226,382, to Lucius Robertson. Artificial tooth plate.

No. 1,226,457, to Evan A. Brown. Dental tray.

No. 1,226,482, to William J. Dossey. Toothbrush.

May 22.

No. 1,226,799, to Harold G. Olena. Toothbrush holder.

No. 1,227,073, to Finis E. Roach. Anchor for dental plates.

No. 1,227,207, to Otto Schwalb. Dental tool.

No. 1,227,277, to Charles H. Land. Burner for dental furnace.

No. 1,227,297, to George H. Neidlinger. Collapsible tube.

No. 1,227,324, to Percy Russell. Air-heater.

No. 1,227,412, to Adam E. Fendrich. Toothbrush.

May 29.

No. 1,227,602, to Ernest Fogg. Artificial tooth.

No. 1,227,687, to Victor Stoll. Measuring device.

No. 1,228,124, to Charles Metzler. Dental waste receiver.

No. 1,228,261, to Joseph J. Taylor. Toothbrush holder.

THE
DENTAL COSMOS

VOL. LIX. AUGUST 1917. No. 8.

ORIGINAL COMMUNICATIONS

A Call for Standardization in Root-canal Treatment.

By ARTHUR BARTON CRANE, D.D.S., Washington, D. C.

(Read before the Virginia State Dental Association, Norfolk, Va., April 17, 1917.)

WHILE current dental literature is replete with evidence of the earnest work of many investigators into the problem of the management of pulpless teeth, the average reader cannot escape the impression that no standardized method of root-canal work has yet been found.

So long as the leaders in this field continue to hold such divergent views, the expediency of root-canal treatment will be open to scientific question. It is necessary, therefore, that out of the mass of evidence which is before us a standardized technique should be established by which the value of all the methods may be judged. When this has been accomplished the root-canal problem will have lost its chief terrors. This paper is not written under the illusion that it will perform this service, but in the hope that the presentation of an eclectic technique resulting from successive trials of the various methods advocated by the masters, supplemented by some original research, may contribute toward ultimate standardization.

The standardization of diagnosis is of prime importance, for without a correct perception of conditions to be met, any treatment becomes empirical. A methodical clinical examination should lay the foundation for diagnostic procedure. If this is properly conducted it will not only indicate suspicious teeth, but in most instances will classify those which may be expected to respond favorably to therapeutics, those whose only hope lies in surgery, and those which must be condemned to extraction.

A glance will reveal the teeth whose color, lack of translucence, gold crowns, and large cavities or fillings suggest further tests for vitality, as well as teeth with post crowns or with such extensive caries that vitality is out of the question.

Having marked all such teeth on the record, the suspected teeth should be further tested by means of the galvanic current. Most vital teeth will react to an 80-v. 1-M.A. current, and while some require more, those with large metal fillings respond to a current of less strength. By testing several teeth whose pulps are unquestionably vital the amount of current required for the doubtful teeth can be determined. It should be remembered that when a canal is filled with the liquid products of decomposition the tooth is often quite as sensitive to electricity as if the pulp were vital, and that teeth with dying pulps are often hypersensitive. For questionable teeth which react to the current, the old thermal tests are not to be despised.

When the lack of vitality of the pulp has been established and recorded, the examination should proceed to a differential diagnosis of periapical conditions. The discovery of fistulæ or scar tissue where these have healed will indicate more or less destruction of periapical tissue, but often there is even greater disorganization where this evidence does not exist.

The degree to which periapical bone has undergone disintegration may be determined by Talbot's(¹) percussion test, quoted as follows from his paper in the DENTAL COSMOS, July 1916:

> Place a finger of the left hand over the apical root or roots of the suspected tooth. With a heavy instrument like a plugger the cusps of the crown are struck at different angles. If the bone cells have been destroyed, the vibration will be readily transmitted through the crown and roots to the finger.

To ascertain the extent of the destruction of the alveolar plate, the writer's test is of value. With a small hard pledget of cotton held in the cotton pliers, the overlying mucoperiosteum may be pushed into the bone cavity, from which it slowly returns when pressure is removed. The appearance is much the same as pitting of the skin on pressure in edema.

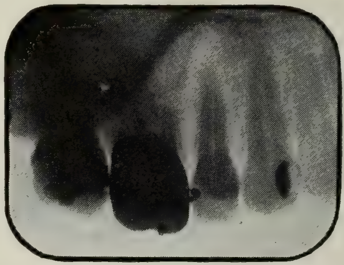
When the clinical examination has been carefully checked off by such reliable history as can be obtained, the teeth recorded as non-vital or suspicious should be radiographed for the completion of the diagnosis.

THE RADIOGRAPH AS AN AID TO DIAGNOSIS.

Correct interpretation of dental radiographs cannot be made in the absence of good clinical data. As I pointed out in the DENTAL COSMOS for December 1911(²), the radiograph is not always conclusive evidence of the condition of the tissues. I can now further state that what Ottolengui(³) in his excellent editorial on radiographic nomenclature calls "radiolucent areas" may exist about the apices of roots whose pulps are absolutely normal, and that the most virulent infection may produce no radiographic evidence at all. (Figs. 1 and 2.) However, to avoid misunderstanding, let me hasten to add that a dependable diagnosis can seldom be made without radiographic confirmation, and modern root-canal surgery is impossible without its aid.

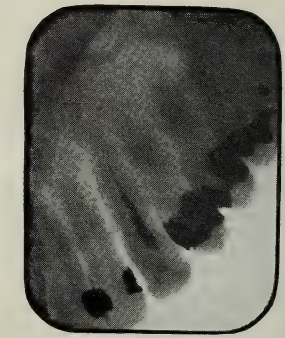
A comparative study of radiographs

FIG. 1.



Radiolucent area about apex of second bicuspid, caused by traumatic occlusion. Pulp vital and normal.

FIG. 2.



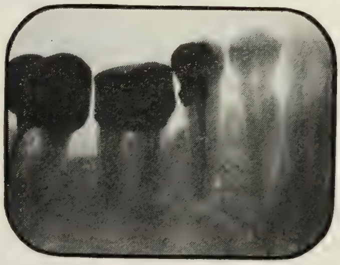
Infected cuspid, with no radiographic evidence of periapical disturbance.

with the actual conditions of the alveolar tissues as disclosed by numerous root resections has led me to the conclusion that in periapical disease we are dealing with three distinct conditions, which may in most cases be differentiated in the film.

FIG. 3.

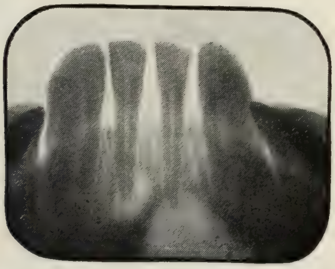
Periapical disease, class I. Note circumscribed radiolucent area about second bicuspid.

FIG. 4.



Periapical disease, class II. Note diffuse radiolucent area about second bicuspid.

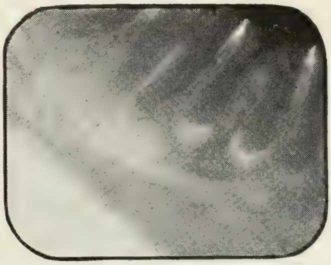
FIG. 5.



Periapical disease, class III. Note circumscribed radioparent areas, surrounded by radiopaque line. These cysts were sterile.

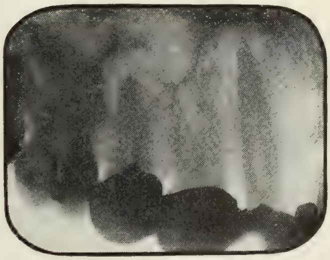
The most common of these conditions at first glance may disclose no abnormality of the periapical tissues, except perhaps a slightly thickened pericementum. There may or may not be evidence of a previous attempt at root-canal filling. This condition is too frequently passed by radiographers of the medical profession, when a closer and more prolonged study will reveal an indefinitely circum-

FIG. 6.



Periapical disease, class I, on mesial root; class III, on distal root, lower first molar.

FIG. 7.



Periapical disease, class II, on cuspid; class III, on second bicuspid.

FIG. 8.

Periapical disease, class I, on left central; class II, on right central; class III, on right lateral.

scribed area to a varying degree more radiolucent than the surrounding bone (Figs. 3 and 6). In cutting down upon these areas, the alveolar plate will generally be found intact, but behind this a mass of soft granulations will be found investing the root apex, while the surrounding bone is normal.

This type of cases offers the most hopeful field for medicinal treatment, as it is an expression of nature's own effort at repair, which only requires a little help to render it efficient.

The second class in frequency of occurrence shows a somewhat irregular radiolucent area, the margins of which are not clearly defined, blending so gradually into normal bone that it is difficult to determine where one leaves off and the other begins. (See Figs. 4, 7, and 8.) These areas are the result of the failure of the reparative effort noted in the first class. When disclosed by the knife a mass of soft granulation tissue will be found, penetrating the alveolar plate lingually or labially, and filling the space indicated in the film. Ramifications from this mass frequently project into the bone in many directions, and wherever this soft tissue exists the adjacent bone will be found to be so disintegrated as to be readily cut away with a blunt curet. The infection in this class of cases is rarely eliminated, even by extraction, unless extensive curetment is performed.

The third class consists of those cases in which the film shows a definitely circumscribed radioparent area, surrounded by a thin radiopaque line, indicating a layer of very dense bone. Here the differentiation of normal and abnormal tissue is well defined. (See Figs. 5–8.) In opening these cases a definite cyst wall is found attached to the root-end. By careful dissection this may be freed from its bony capsule, and by resecting the root just below its attachment the whole cyst may be removed *en masse.* The surrounding bone, which is white and dense, need not be disturbed.

These cysts or so-called "abscess sacs" may or may not be infected, but it is my belief that infection is always secondary to their formation. They are frequently found on the roots of teeth which have become devitalized through some traumatic agency, and are identical with the dental cysts so exhaustively described by Scudder(4). It is difficult to conceive how an area so efficiently walled by a dense fibrous sac and a still denser bony capsule can be an extremely dangerous focus of infection, and yet the intensely dark spot they produce on the film often causes them to be viewed with the greatest alarm.

A further important point for study in the radiograph is the condition of the root apex, and this is obviously of greater prognostic value than the condition of the surrounding bone, for if the cementum is exposed and roughened we may be sure that there is no treatment by which this infected necrotic tissue can be restored to life, to say nothing of health.

Before leaving the subject of diagnosis it must be added that while awaiting the discovery of a method of predetermining in which teeth the new growth of cementum, pointed out by Noyes(5), has or has not sealed the apical foramen, any pulpless tooth without a complete root-filling should be considered a possible focus of infection, no matter what the periapical condition. We must constantly bear in mind that the radiograph is but a record of macroscopical conditions, while infection is the result of microscopical invasion.

OPENING AND CLEANING THE ROOT-CANAL.

Before the canal is opened it is a wise precaution to attempt the sterilization of the coronal dentin. Grieves has been sealing-in a 10 per cent. solution of creasote in oil of cloves for this purpose, with satisfactory results. The clove oil is used as a penetrating menstruum to carry the creasote, which in 10 per cent. solution is not coagulent, into the dentin. A somewhat limited experience with this combination leads me to advocate its use. Where the pulp chamber has not been opened formocresol is a valuable agent for this purpose, but it requires three or four days to sterilize the dentin by any method.

After the attempt to sterilize the coronal dentin, the tooth should be opened only when blocked off by the rubber dam, which should expose as few teeth as necessary to give an unobstructed view of the field. These teeth should be rubbed dry with sterile gauze, and then, along with the adjacent dam and clamp, be painted with tincture of iodin, which, after it has dried, may be washed off with alcohol to lighten the field.

The coronal cavity may now be opened, and so shaped that free direct access may be had to each canal in a straight line with its long axis. It is unfortunate that this often means extensive destruction of sound tooth substance, but, even if the whole crown must be sacrificed, the procedure is justified. The preservation of the natural walls of the pulp chamber will greatly assist in locating the canals.

The work in the canal proper is begun by exploring to its apical extremity. Upon the accomplishment of this task the success of the subsequent work depends. There are certain canals which cannot be so explored by any technique at present available, and without the strictest aseptic precautions no canal can be opened to the extremity without danger of infecting the periapical tissues.

Let us, then, assume that anything which touches the field must be sterile.

CHEMICALS AS AIDS IN OPENING CANALS.

With the finest broach of piano wire, first suggested by Simpson as a finder, the attempt is made to explore the canal by a series of pushing and picking motions, until the instrument passes through the apical foramen. If the progress of the broach is stopped, slight quarter-turn twisting motions will sometimes allow it to proceed. If this fails, chemical aid is indicated. As suggested by Buckley(6), this should not be undertaken blindly, but the cause of obstruction should be ascertained. Alkalis should be used for organic blockade, acids for inorganic, and suitable solvents for previous canal fillings.

The principal alkalis are sodium-potassium alloy introduced by Schreier(7) and advocated by Rhein and Ottolengui, sodium dioxid recommended by Kirk, and sodium hydroxid suggested by Pruyn.

Of the foregoing group, sodium-potassium has been most efficient in my experience. The principal acids are 30 per cent. sulfuric acid, as advocated by Callahan, phenol-sulfuric acid, introduced by Buckley, or hydrochloric acid, recently proposed by Grove. Callahan's method seems to meet all requirements and has the advantage of a long record of successful use. One or the other of these chemicals will assist the broach to penetrate any natural obstruction.

For artificial obstructions of gutta-percha, chloroform, xylol, or toluol may be used. Most of the proprietary root pastes dissolve in acid. Gold or cement must be painstakingly picked out. Broken instruments may often be removed by working alongside with sulfuric acid and then using a twist broach with an untwisting motion.

After the path is once open, successive sizes of smooth broaches carrying homeopathic doses of indicated chemicals should be used until the canal is large enough to allow the insertion of a diagnostic wire, first used by Kells. For this purpose I use a strand of unbraided picture wire, and, where the caliber of the canal permits, this is wrapped with fibers of cotton and saturated with any medicinal agent indicated.

A radiograph will now show the extent to which the canal has been opened. If this has not been completely accomplished the picture will be suggestive of subsequent procedure. If the canal is straight, a broach with a cutting point may be used to complete the opening; if curved, the smooth broach should be curved to approximately the same degree, and the gentle pushing and picking motions should be resumed with the assistance of the indicated chemical. A common error in dealing with curved roots is to enlarge the canal with reamers in the direction of the long axis of the unexplored portion. This might be tried as a last resource, but to mutilate the canal with any instrument prior to exploring it to the end is to invite almost certain failure to accomplish the desired result.

The attempt to use a broach of any kind as a gimlet will often result in forcing débris ahead until the canal is occluded. The formation of a shoulder or offset which will deflect the broach when again used, or the fracture of the instrument within the canal, are other potent probabilities of this indiscretion.

Where other methods fail, the use of the finest Kerr root file or Young broach in quarter turns is sometimes indicated, but the withdrawal and cleansing of the instrument at frequent intervals should not be neglected.

If the canal cannot be opened through the end it should be enlarged and filled as far as possible, and the unfilled portion of the root subsequently resected.

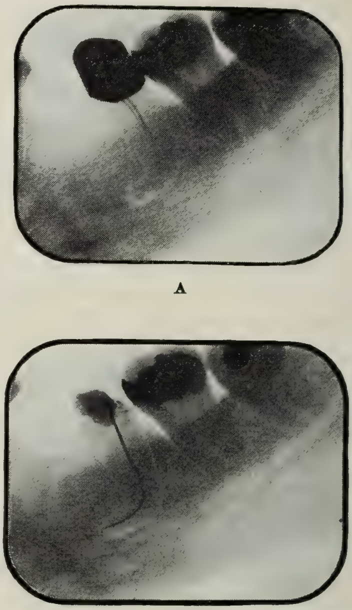
ENLARGING THE CANAL.

Having reached the periapical tissue by whatever means, the next step is to enlarge and reshape the canal, thereby incidentally removing most of its organic content, especially where judicious use is made of sodium-potassium alloy.

The object is to make the canal of such caliber that a sufficiently firm gutta-percha point may be employed in filling it, and to leave it conical in shape, so that when pressure is brought to bear on the cone at the orifice it will be packed simultaneously against the walls and apex of the canal.

This result is safely obtained by means of a twist broach of the Kerr root-file type, or a grooved broach of the Young type, of no larger gage than the last smooth broach employed. The instrument is carefully pushed to the end of the canal and withdrawn with lateral pressure. This is repeated again and again, always working toward the crown, never toward the apex, scraping systematically all around the canal. A slightly larger broach of the same type is now substituted, in the same manner passing it to the apical opening, and shaving the walls of the canal only upon withdrawal. By using successively larger sizes of broaches and repeating the technique just described, the canal, even if curved or twisted, can be enlarged to any required size. (See Fig. 9.)

Fig. 9.



A

B

The result of one hour's work by technique herein described is shown in B.

STERILIZING THE CANAL.

The recent work of Dakin and Carrel has gone far toward establishing the fallacy of most of our antiseptic medication, but a free application of their principles will not hold in root-canal therapy, for within the canal of a pulpless tooth there is no phagocytosis, and consequently if the dentin and its tubuli are to be sterilized it must be by the direct application of disinfecting agents. Since Grieves, Black, and others have demonstrated the deleterious effect on the periapical tissues of such drugs as oil of cinnamon, phenol, or formocresol, our choice of agents for sterilizing the canal is limited to the blander antiseptics.

Black(⁸) states that—"The oils have a greater affinity or attraction for the dentin than has the moisture, and therefore displace it. In practice this is a much better method than drying with hot air or hot instruments. The drying is done much more perfectly and much more easily." If this be true, then the continued dressing of the canal with a non-irritating antiseptic oil should serve not only to sterilize the dentin, but should fill the tubuli with a fluid which will be readily miscible with chloro-percha.

Apinol is one of the "new and unofficial remedies" adopted by the American Medical Association. It is obtained by the destructive distillation of pine wood and is a pale yellow oil which becomes darker with age. It is a mild antiseptic and a fair germicide, also a slight solvent of gutta-percha and freely miscible with chloroform. In my practice it is the routine antiseptic for dressing the canal.

IONIZATION.

An attempt to disinfect the periapical tissues should precede the filling of the canal. The claims of Rhein and his followers, based mostly upon clinical evidence, that ionization with the electric current presents an efficient method of accomplishing this desirable end, have recently been investigated by Price, Fette, Prinz, and many others. While their findings differ slightly in detail, in the main they agree with Rhein's teaching. Much further work will be needed to improve the still-existing somewhat empirical technique. The amount and duration of the current, the number and frequency of the treatments, and the choice of ionizing agents must all be placed upon a more scientific basis in order to standardize this most helpful medication.

NECESSITY OF BACTERIOLOGICAL TESTS FOR STERILITY.

When clinical evidence indicates the sterility of the tissues, this should be checked off by laboratory findings. Two methods of obtaining material for culture are in vogue. One consists in aspirating some of the fluids from the periapical region. This method is often difficult, and its scientific value is lessened by the possibility of gathering cultures from deep in the tubuli, or even from the subgingival space. The other plan is to gather on the tip of an apexographer some of the periapical content by passing the instrument through the canal. This is also open to scientific objection in that the material is gathered from the tissues in direct line with the canal, where the greatest force of antiseptic treatment is expended, while the little crypts surrounding the area of disturbance are the points of greatest expectancy of remaining infection, and these cannot be reached.

Whichever method is employed, sufficient time should be allowed for incubation of the slower-growing organisms. The possibility of admixture with the antiseptic used in dressing the canal should also be considered. With the agar slant ten days is not too long to wait for a negative report. The use of fluid media, followed by plating on blood-serum, may lessen this time.

Having secured a negative report on the laboratory findings, the canal is ready to fill. It is of importance, however, to recheck this report with clinical evidence, for if there is seepage or odor in the canal, further treatment is indicated.

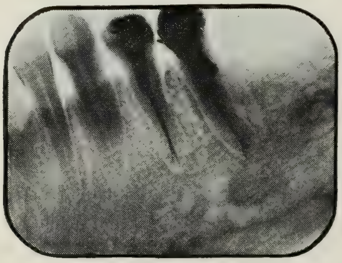
TECHNIQUE OF FILLING THE CANAL.

The technique of filling or, more properly speaking, obliterating the canal must take into account the dentinal tubuli and accessory foramina. Let no one delude himself with the idea that he can fill any part of the canal or tubuli which has not been previously depleted of its organic content. It is in this exigency that the great value of the use of sodium-potassium alloy in enlarging the canal is manifest, and the desirability of having the dentin soaked with a solvent of chloro-percha is evident.

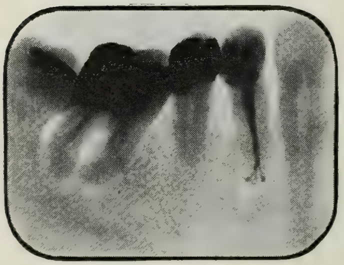
Callahan(⁹) has devised the method

now in general use of pumping into the canal a solution of resin in chloroform for the purpose of sealing the tubuli, and has proved beyond argument that this resin varnish does penetrate the dentin nearly if not quite to the cementum. He has failed to demonstrate, on the other hand, to the best of my knowledge, that it in any manner seals the tubuli. Certainly it will not seal the porosities of the hard-pressed filter paper used to filter barium salts, which are about one-tenth the diameter of the tubuli. Furthermore, it is susceptible of proof that micro-organisms will grow through it at room temperature. The principle of using such a varnish is one of the greatest steps forward in root-canal surgery, but it would seem that the efficacy of Callahan's formula should be determined, or more adequate materials substituted.

Fig. 10.



A



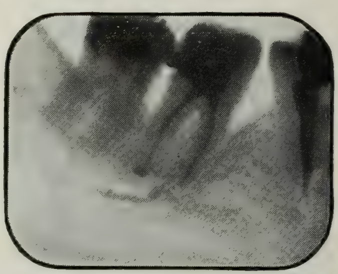
B

Multiple canal endings, filled by technique herein described.

Pending the elucidation of this point chloro-resin may be used for the possible added adhesiveness it gives to the chloro-percha. The canal is flooded for dissolving a gutta-percha point according to the Callahan method. The chloro-percha formed is thus introduced into the canal and such accessory foramina as are open, and possibly into the orifices of the tubuli as well. (See Fig. 10, A and B.)

When this has been accomplished, a cone of gutta-percha should be selected which will approximately fit the canal. This should be moistened with chloro-resin and gently insinuated as far as may be into the canal. Sufficient time should now be allowed for the chloro-percha to become thickened by evaporation of the chloroform before bringing great pressure on the gutta-percha point, otherwise it will be almost impossible to avoid forcing the material into the apical tissue. (See Fig. 11.)

Fig. 11.



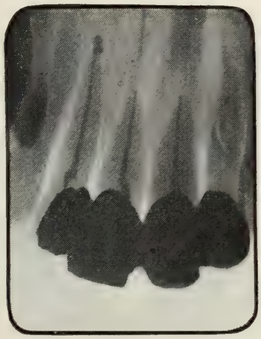
Runaway chloro-percha resulting from pressure on cone while chloro-percha was too fluid. Note beautiful result in distal root, in which the chloro-percha became gummy.

If the canal is properly prepared to a conical shape and the chloro-percha is of the right consistence, the cone may be forced home with pluggers, first by hand instruments and then with the automatic mallet. This will result in pressure being exerted laterally as well as longitudinally, thus driving the chloro-percha toward the tubuli as well as toward the apical opening and accessory canals.

A careful examination of the apical termination of the canal in a number of extracted teeth will reveal the fact that in a goodly proportion there exists a crater-like depression in the cementum at this point. This should be considered an integral part of the canal in so far as the filling operation is concerned.

If the technique indicated has been followed, while the chloro-percha has been thickening in the canal the point of the cone has been softening, and when pressure is brought to bear on the cone this gummy tip flows into the periapical space where tissue is missing. It distends but does not penetrate the surrounding granulations, so that with the natural reaction of the tissues it is forced back, thus capping the exposed portion of the root and filling the crater-like opening of the canal. (See Fig. 12.)

Fig. 12.

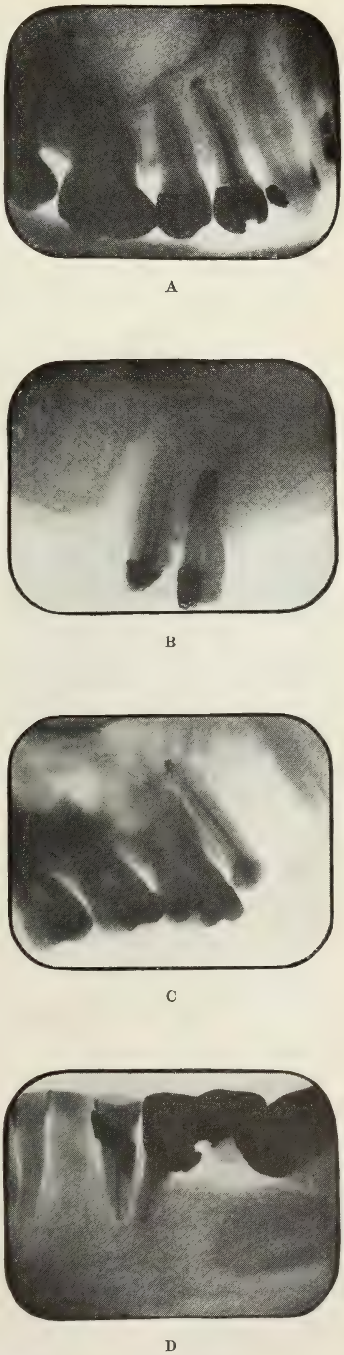


Capped filling of lateral; author's technique. *Note:* Centrals had normal pulps extirpated, and no periapical disturbance, hence were not capped.

The projection of a solid gutta-percha point periapically will generally cause a puncture of the tissues, setting up an unnecessary irritation followed by a violent reaction. Such projection can serve no purpose which cannot be better accomplished by the method just described, and which I advance as being a happy compromise between the partially filled and overfilled canal. (See Fig. 13, A, B, C, D.)

In all cases where sterilization cannot be accomplished, as well as those cases where the primary diagnosis determines the unavailability of therepeutic measures, surgery may be depended upon to control the infection.

Fig. 13.



Capped fillings, author's technique. *Note:* The coronal fillings and bridge are temporary.

SURGICAL DRAINAGE OF INFECTED AREAS.

Next to extraction, the simplest of the surgical procedures is drainage through the alveolar mucous membrane. This is nature's own method of combating the disease, hence it is not surprising that prolonged drainage through a window cut in the alveolar plate over the infected area often changes a doubtful prognosis into a hopeful one. The adoption of this rational method is much to be preferred to prolonged medication through the canal. Dependence upon antiseptics to accomplish in the mouth that which has proved to be impossible in other parts of the body will lead only to disaster. The redemption of dentistry as a healing art lies in a more universal adoption of surgical principles.

It is improbable that any periapical infection which has once reached the stage of pus formation—or liquefaction of tissue—can long persist without destruction of the apical fibers of the pericementum. In the presence of the dead cementum thus produced, little is to be expected of medicinal treatment. Whether acute, chronic, or dormant, such cases call for surgical interference, as the presence of an infected necrotic area cannot be ignored.

In acute cases simple drainage may suffice, but in chronic cases more or less necrotic tissue will require surgical removal. This may or may not involve the resection of the root apex, but in any event prolonged drainage through the alveolar plate may be maintained to advantage.

INDICATIONS FOR ROOT RESECTION.

Where any considerable portion of the apical cementum is denuded, resection of the necrotic portion of the root is indicated. This should be achieved under the aseptic technique recommended by Hartzell(¹⁰), and after the apex has been removed, the end of the stump should be filled with amalgam, the cavity extending in all directions as near the cementum as feasible. (See Figs. 14–16.) For the suggestion of this excellent method of at once blocking off all infection within the tooth and guarding against absorption of the root, I believe we are indebted to Lucas.

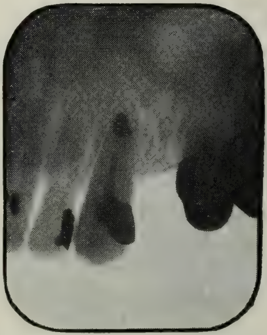
Fig. 14.

Class II. Periapical disease of cuspid.

Fig. 15.

Same, a few days after root resection.

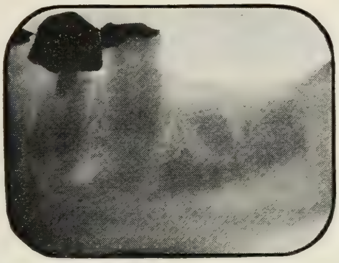
Fig. 16.



Same, one year after Fig. 15.

If the infected area is inclosed by a fibrous sac, and this sac in turn is surrounded by a bony capsule, immediate complete suturing of the wound may be tried, but it seems more in keeping with the findings of modern surgery to maintain drainage in most cases by means of a gauze wick leading from the deepest part of the wound.

Fig. 17.



New bone-growth in presence of infected root apex left in by incomplete extraction. Note radiolucent area surrounding fragment.

Fig. 18.

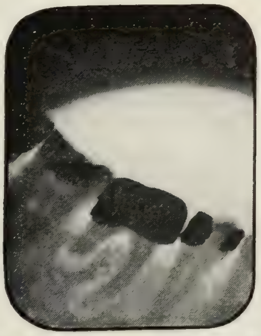
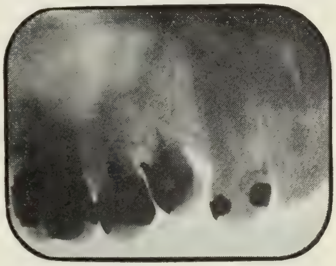


Fig. 19.



New bone-growth in presence of streptococcus infection filling-in area once occupied by resorbed root apex.

In molar teeth, if only one root fails to respond to treatment this may be cut away from the tooth at the point of bifurcation and extracted. The filling of the healthy roots should precede the bisection of the tooth.

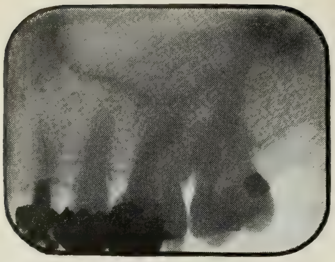
A rational method of replantation would mean the salvation of many molar teeth now sacrificed. A theoretical technique, as yet too unsubstantiated to be reported, leads me to hope that a successful solution of this problem may yet be found.

When, after the most elaborate efforts, we have at last completed our attempt to control periapical infection, and the patient is dismissed, how shall we know that we have accomplished our object? Clinical evidence, long depended upon as sufficient, has been utterly discredited. A negative culture may only indicate that we failed to find the infection, and not that it is eliminated. A radiograph after six months or a year may indicate a deposition of new bone about the root-end. That absolute dependence cannot be placed in this is evidenced by the fact that new bone-growth may take place in the presence of infection. (See Figs. 17–19.) This is demonstrated by the filling-in of the area once occupied by an absorbed root, or by the formation of new bone in the alveolus over a root-tip left in by extraction. And even where sterilization is accomplished, Grieves tells us that the new tissue is an area of lowered resistance which invites hematogenous reinfection.

Shall we attempt, then, to restore the integrity of the tissues—see Figs. 20–22—or join the ranks of the pro-extractionists, professing that dentistry has made no progress in this important task for more than a third of a century?

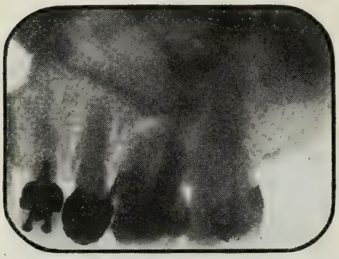
Decidedly, our duty lies in the intelligent treatment of teeth, for the skepticism expressed against such proofs as can be offered in justification of this procedure is not changed to confidence when the same tests are applied to the alveolar

FIG. 20.



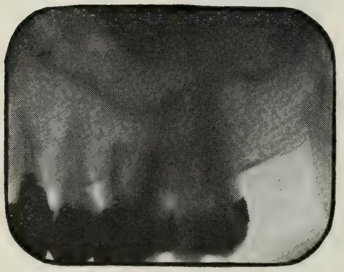
Periapical disease, upper first molar. Class III, on lingual root; class II, on buccal roots.

FIG. 21.



Same as No. 20. Canals opened, ionized, and filled. Buccal roots resected, lingual root curetted.

FIG. 22.



Same as No. 21. Result one year later.

tissues after extraction. The growing number of cases being recorded in which systemic infections have yielded unaided to the elimination of the foci of infection by the treatment and filling of root-canals is equally as convincing as the same result following the extraction of teeth.

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The Importance of a Correct Diagnosis of Gingivitis and Suppurative Pericementitis.

By IVAN R. COTTRELL, D.M.D., Rochester, N. Y.

IF we are to be successful in our treatment of the pathological conditions about the teeth we must learn to recognize their causes and first stages. Too often in the past it has happened that the most common factors that enter into the etiology of the diseases of the gingival tissues and the peridental membrane have been overlooked. Too little consideration has been given to the direct relationship between the inflammations of the gingivæ, which are the actual beginnings of the diseases of the peridental membrane, and the formation of the pus pockets. Often the primary inflammation has not been recognized until actual destruction of the peridental fibers has occurred. In speaking of these inflammations not being recognized, I do not mean that they have not been seen; we have seen them, but have not associated them with diseases of the peridental membrane as cause and effect, and consequently we have not instituted treatment until irreparable damage has been done.

When the diseased conditions have been recognized, the treatment has not generally been scientific nor applied with a correct understanding of the *normal* tissues supporting the teeth. There has been no definite knowledge of the pathology, and very little or nothing known as to the etiology. In fact, treatment has been based more or less on the symptoms that the disease presented at the moment, and has been applied in the form of some favorite remedy.

To successfully treat a disease condition we must first have a definite knowledge of its etiology and pathology. Only then are we in a position to apply a rational and scientific treatment. When these different phases have been studied and thoroughly understood it will be clearly seen that the best success can only be had by the preventive treatment; for if any part of the peridental membrane is destroyed, we know that a restoration to normal by a reattachment of the fibers to the cementum cannot be brought about, and that to attain our greatest success treatment must be applied to the inflammations that precede the detachment of these tissues. And so the key to successful treatment is to recognize these primary inflammations and the various factors that produce them.

It is of the utmost importance that the differences between diseases of the gingival tissues and the peridental membrane be recognized as a basis for a correct diagnosis. One who is able to make an accurate differential diagnosis between these two diseases will have no trouble in determining the best course to pursue in the treatment to attain successful results.

Inflammations involving the gingival tissues are definite and distinct from those involving the peridental membrane. The fact that inflammations caused by deposits of salivary calculus may destroy all of the investing tissues around the root, generally without the formation of pus pockets, requires that these inflammations be studied apart from the inflammations that produce true pyorrhea pockets.

To have a clearer understanding of the disease conditions with which we have to deal, it is first necessary to have distinctly in mind the *normal* arrangement and structure of the tissues involved.

NORMAL ARRANGEMENT AND STRUCTURE OF THE INVESTING TOOTH TISSUES.

Briefly, then, the gingival tissue invests the gingival portions of both the roots and the crowns of the teeth. It rests upon the crests of the alveolar process, and joins the gum tissue without any line of demarcation. It is attached to the gums by continuity of tissue, and by fibers to the alveolar process and the roots of the teeth. Its function is to serve as a protection to the roots of the teeth and the tissues that support them. Injury to this gingival tissue usually begins at the portion which folds upon the crowns of the teeth rather than at the deeper portions. It is the extension of these injuries of the gingivæ and their resulting inflammation that destroy the underlying peridental membrane, and, if the injury be localized in character, it results in the formation of a true pyorrhea pocket. So it is seen that upon the integrity of the gingival tissue depends the health of the peridental membrane, the support of the teeth, and the prevention of pyorrhea pockets.

The term peridental membrane is applied to the soft tissue located between the root of the tooth and the bony walls of its alveolus or socket. It is most decidedly a fibrous membrane. The fibrous tissue is of the white inelastic variety, and its greater bulk is composed of the principal fibers, as they are called. These principal fibers are divided into three main groups—the horizontal, the oblique, and the apical groups. The fibers of the membrane have their attachments in the alveolar wall on the one side and extend into the cementum on the other, in this way serving to maintain the tooth in position. Besides its physical function of supporting the tooth, it has a vital function, in that it is the place of development of the osteoblasts which build the alveolar walls or process, and of the cementoblasts which build the cementum of the root.

The alveolar process is, of course, a transitory organ, being developed as the teeth erupt, and absorbed as the teeth are lost.

During their development the osteoblasts lie upon the bone of the inner surface of the alveolar process, and form a continuous line except at points where the principal fibers pass between them for their insertion into the bone. Fibers of the membrane which become detached from the bone may be reattached by the osteoblasts building new bone, the fiber ends calcifying with this bone. This reattachment, however, takes place only very rarely, and then only under aseptic conditions.

The cementoblasts lie upon the cementum of the tooth, as do the osteoblasts on the surface of the bone, and are instrumental in the building of cementum by depositing lime salts, certain of these cells being left in the cementum as cement corpuscles. Now, the cementum has no blood circulation and cannot receive through the dentin any assistance in rebuilding absorbed or destroyed portions. Replacements must therefore be made through the peridental membrane, and if the substance of the cementum is not saturated with pus and the cementoblasts are still vital, then, and then only, can there be new cementum deposited.

So if once the peridental fibers are severed from their attachment at the cementum, and since detachment without infection is rare, a permanent injury has been done; and, too, because no blood supply reaches the cementum, the necrotic tissue of the membrane remains to serve as a culture medium for bacteria from the mouth. Such a condition exists in no other part of the body, and therefore calls for special surgical treatment. This, then, represents briefly a description of the normal arrangement of the tissues about the teeth.

GINGIVITIS.

With a mouth in normal condition the first visible indication of a pathologcial change is inflammation at some point. *Inflammation is a danger signal.* Wherever we observe the outward and visible signs of inflammation we have an indication that something abnormal has occurred in the tissues, something which has brought about a reaction on their part. Thus it is our duty to determine as soon as possible what that something is. *Our object is not primarily to reduce the inflammation, but to remove the irritant.*

For all practical purposes the typical forms of diseases of the tissues supporting the teeth may be divided into two groups. The first of these is gingivitis, which may occur in all stages from a slight inflammation to a general pyorrhea. The second division is a chronic suppurative pericementitis, in which we have the true pyorrhea pocket.

The first form of disease is a general gingivitis, a disease that involves primarily the gingival tissue only. It is, in distinction from the other form, a general condition attacking all of the teeth with varying degrees of severity. It is usually found in uncared-for mouths where no attempt has been made to maintain a sanitary condition. Its chief cause is the accumulation of salivary calculus, together with food débris and large masses of bacteria. Ill-fitting crowns and bridges and rough fillings also contribute to bring about this condition. Through the irritating effects of these factors a destructive inflammation is brought about, and, if it be allowed to progress unchecked, the peridental membrane will be gradually destroyed, eventuating in the loss of the teeth. Pus may or may not be present, although with so much destruction of tissue there is generally a quantity of pus being absorbed from around the teeth into the circulation. True pyorrhea pockets do not as a rule develop in this form of disease. This condition is not established at once, but is the result of years of neglect.

The establishment and maintenance of a sanitary condition of the mouth restores health to the parts in these cases. This is accomplished by the thorough and complete removal of the deposits, by the training of the patient in the means of preventing recurrence of the deposits, and subsequent examinations at stated intervals.

SUPPURATIVE PERICEMENTITIS.

The second form of disease is known as suppurative pericementitis or true pyorrhea. Distinguished from general pyorrhea or gingivitis, suppurative pericementitis is a *localized* condition, that is, only certain teeth of the mouth may be affected. Some form of inflammation always precedes the formation of a pus pocket, and clinical experience has proved that almost invariably the prime factor in the cause is trauma, either in the form of malocclusion or a faulty contact point. In proportion as this traumatic factor is recognized as a cause, and is acted upon, will there be fewer pyorrhea pockets.

The pockets are most frequently found between the teeth in the bicuspid and molar region, and along the lingual surfaces of the upper incisors. The appearance of the gingivæ varies greatly; in some cases with very deep pockets, the gingivæ look well, in others a distinct redness is seen. Unless one be trained to look for these places of inflammation, and follow a definite system of examination, the beginnings of these pockets are generally overlooked. The inflammation continues and infection takes place, resulting in destruction of the underlying peridental fibers and in the deposit of serumal calculus on the root. Absorption of the alveolar process to which the detached fibers were connected takes place. This condition progresses until either the tooth is lost or the correct treatment is applied.

CORRECT TREATMENT OF TRUE PYORRHEA.

What is this correct treatment? When one thoroughly understands the fact that these pockets are the result of some *local irritation* or *injury* to the tissues supporting the teeth, then it is clearly understood that the first thing to do is to remove the cause. All of the various factors that enter into the consideration of these causes must be properly valued, and invariably the prime factor will be found to be trauma, either in the form of malocclusion or faulty contact points. So the first procedure in the treatment is to correct the malocclusion and restore the lost contact points. When, again, it is understood that with the formation of a pyorrhea pocket permanent detachment of the peridental fibers takes place, this gives us the basis for our second step in the treatment. The second procedure, then, is the surgical removal from the roots of the teeth involved of the products of the disease, which are the serumal calculus and the necrotic membrane. This calls for special instruments and a delicate surgical technique that is obtained only by an extensive clinical experience. The third factor is the maintenance of a sanitary condition of the mouth by prophylactic treatments and sanitary dentistry. These steps in the treatment, followed out in detail to completion, will result in a *cure* of the disease and a restoration of the tissues to normal health.

And what do we mean by a cure? We consider that a cure has been effected when a condition of health has been established and is maintained. It in no way alters the fact that a cure has been established if a recurrence should take place; for if the original causes are again given sway, a recurrence of the disease may be the result, unless immunity has been established. What is generally considered a recurrent pyorrhea is not a recurrence but a continuance because of incomplete treatment, and is certainly evidence that the case has not been cured completely. A semblance of a cure may be effected by partial treatment and be kept so under favorable conditions by prophylactic treatments or medication; but what should be considered as a permanent cure is the restoration of the tissues to health and their maintenance in this condition without recourse to further treatment. This is what can be done and has been done many times.

On the basis of our present-day knowledge of the diseases of the tissues about the teeth and our application of scientific treatment we shall have to correct the belief of our patients as to the incurability of pyorrhea alveolaris. No good will ever come from the belief that pyorrhea cannot be cured, and a great deal of harm is daily being done to these patients by the absorption of the toxic products of this disease. As long as they believe that it is incurable they will naturally refuse to undergo treatment, and so will be deprived of the benefits they might derive from it.

If a practitioner fails in his attempts to cure this condition, he should not conclude therefrom that a cure cannot be effected. If he fails there is good reason for it, and after a more complete understanding of the condition he may succeed later on. The treatment is not obscure and complex, but like any delicate surgical operation it presents many sides, and cannot be mastered in a short time or with little effort or thought. The busy general practitioner, whose time is filled with many other things, cannot hope to succeed in the treatment of difficult cases. If a man possesses the inherent ability, with proper experience and practice, he can acquire the necessary knowledge and technique, as has been proved by many specialists in the treatment of this disease.

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The Electro-therapeutic Action of Certain Ions.

By ERNEST STURRIDGE, D.D.S., L.D.S.Eng., London.

IT is interesting to note the attention that is being given at the present time to the therapeutic use of the electric current in dentistry, and at this juncture, when dental literature is amply supplied with articles on the topic, which doubtless attract the attention of earnest workers in quest of knowledge on this vast subject, the writer ventures to sound a warning note in respect to *vague statements* and *hasty conclusions*—which are published, no doubt, with the sincerest intention of helping the student of electro-therapeutics to grasp the fundamental principles of a subject so full of phenomena and unsolved problems.

As Fette points out in his article in the DENTAL COSMOS for March 1917, if it were necessary for the ordinary individual to procure "a knowledge of all the fundamentals of the theories involved in electrolytic medication as a prerequisite, the generality of the profession could not adopt this mode of medication." This writer, however, does not hesitate to introduce points of high technicality relative to the appearance of ions in an electrolyte about the surface of iron and copper electrodes—giving, rightly, the "positive answer" as to the cause of this phenomenon, that the ions are due to electrolytic solution pressure*—and then vaguely dismisses the subject as beyond the scope of the paper. In his "conclusions" he exhorts the profession to "try out the application by means of the galvanic current of Dr. Martin H. Fischer's salt solutions in edematous conditions about the mouth."

Without giving any idea of the composition of these solutions, this vague statement is thrust on the minds of his readers with the assurance that "The one successful and rapid means of relieving those troublesome swellings about the gums . . . . would amply justify the practitioner in familiarizing himself with the principles and technique of electrolytic medication." Still more remarkable is the assertion that "Neither cataphoretic nor anaphoretic transport is intended, but, primarily, only that of either positive or negative ions of the solution." According to this, anyone may procure this solution and apply it electrolytically without understanding the principles of electrolytic dissociation of ions. There is nothing better calculated to bring this useful method of treatment into utter disrepute than this. The writer has frequently insisted that the most useful way to approach this subject is to acquire a sound knowledge of electro-physics as applied to medicine, and adopt the best technique for dental treatment, with strict observance of those principles which govern the current under circumstances relative to the particular operation to be performed.

The theory of ionic medication, "electrolytic dissociation," or "electrolytic medication," is most ably dealt with by Prinz in an article in the DENTAL COSMOS for April 1917 on "Electro-sterilization of Root-canals." Very concise information may be gathered from this article on the theory of dissociation and migration of ions, and one of the most valuable results of his many experiments in this article is his formula—electro-sterilization equation—setting forth a *definite time* required to sterilize a root-canal in relation to the *current strength* employed.

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* A brief explanation of electrolytic solution pressure is to be found in "Medical Electricity," p. 13, by Lewis Jones.

Still, as scientific and interesting as this paper is, it is disappointing to find that Prinz violates the principles of the very theory he so precisely explains by using sodium chlorid electrolytically with the *positive pole,* and relying on the dissociated chlorin as his sterilizer. Chlorin is an anion, and does not migrate from this pole; it can only act in a passive capacity on the surface of the root-canal, and does not penetrate the tubuli of the dentin. The conducting ion in this electrolyte is the sodium, which penetrates the tubuli and apical foramen, with what effect is not stated. Notwithstanding the wonderful sterilizing properties of chlorin, it is doubtful if clinical experience in the long run will uphold sodium chlorid in this capacity as a sterilizer for the treatment of root-canals, for the reason given.

Relating to the penetration of metallic ions into the tubuli of dentin, Prinz was singularly unsuccessful in his experiment with ferrous ions colored with ferricyanid of potassium, in which he states that only the faintest trace of Prussian blue was seen in the inner walls of the canal. (See p. 382.) The writer has made the experiment many times, and has demonstrated that the ferrous ions penetrate the *entire length* of the tubuli, the only difference in technique being that the apical foramina were not sealed, which is more in accordance with actual conditions. At a meeting of the Second District Dental Society of the State of New York, November 1916, the writer showed lantern slides of photomicrographs of this experiment, in conjunction with Dr. Stein of New York, who kindly cut and mounted the specimens for the occasion. These exhibits fully demonstrated this assertion, and from this the writer concludes that the dissociated metallic ions of certain salts are transported by the current into the tubuli, and, if the ions are sterilizers, their function will be to destroy micro-organisms which have penetrated the tubuli.

Prinz maintains that the zinc chlorid solution will bleach indigo-blue just the same as will sodium chlorid (p. 380). Indeed, it will do so in precisely the same time, employing the same current strength. Chlorin is liberated in precisely the same way by the electrolytic action of the current, and when this solution is adopted in the treatment of root-canals it has the additional advantage that the conducting ion in this case is zinc, which is claimed to be an antiseptic ion. But Prinz further states that "Ionized zinc of the zinc chlorid solution possesses no merits as an antiseptic agent."

This statement is opposed to the findings of the best-known medical and dental electro-therapeutic workers, and requires more proof than has been offered to negative the recorded evidence in favor of the highly antiseptic properties of zinc ions.

Free chlorin which does not migrate *from* the positive pole could not possibly be accounted the sterilizing agent in the treatment of chronic ulcers, tropical ulcers, lupus, syphilitic ulcers, sinuses, rodent ulcers, pyorrhea alveolaris, fistulæ, etc., in which sterilization is required not only on the surface, but—as pointed out by Lewis Jones in the case of chronic ulcers—at the floor of the ulcer, where only ions which penetrate a considerable depth would be of the slightest use; this chlorin does not do, as Prinz himself is careful to say. All the mentioned septic disorders have been cured by the dissociation and penetration of zinc ions alone. Clinical evidence to this effect has been recorded by such writers as Leduc(1), Lewis Jones(2), Finzi(3), Doyle(4), Bathurst(5), Marques and Pappon(6), Norman Bennett(7), Webster, and many others who might be mentioned.

The writer has had excellent results in the treatment of root-canals, granulomas, and pyorrhea alveolaris, by ionic medication with zinc ions. Webster advocates the use of zinc sulfate for the same treatment, in which chlorin plays no part.

Prinz in his conclusions admits that copper, silver, and mercury ions possess germicidal properties ("but only to a limited degree"), but he excludes zinc, contrary to the findings of the many writers who have been mentioned, all of whom consider zinc more efficacious than the others.

There is no intention of casually gainsaying the authority of the writers referred to in this paper. It is important that attention should be drawn to vague statements and hasty conclusions which appear inaccurate, and it is with great deference that this is undertaken.

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Mistakes Made in Root-canal Work.

By WILLIAM A. SPRING, D.D.S., New York, N. Y.

(Read before the Northeastern Dental Association, Hartford, Conn., October 11, 1916.)

MR. PRESIDENT AND GENTLEMEN:

IT is to me a special pleasure and honor to meet on this occasion with the Northeastern Dental Association, this New England society. I am a New Englander myself, a native of Vermont. All of my professional experience before going abroad was in Vermont and in Maine, and I have often felt that any good I may have accomplished has been due to my early New England training, and to the vigorous influences of the two practices in which I worked.

It would seem to me an act of temerity for anyone who has operated an X-ray machine but a little over a year to offer a new theory or method in root-canal work, therefore I shall not attempt that, but I can tell you of mistakes, and perhaps even grow eloquent, for some of the mistakes I shall mention are my own and are fresh in my memory.

The purchase of an X-ray machine and the exposure to my vision of what I was doing, and what I was failing to do, and my conscientious endeavor to conquer, has given me the hardest year of my professional life, and in the beginning my shame and chagrin over an incomplete filling, especially in a straight canal, would have been followed by actual discouragement had not experienced radiographers informed me that they often had to fill roots a second time.

The first mistake I shall record is attempting to do any canal work without properly isolating the tooth with the rubber dam. How often we recall teeth which were perfectly comfortable until opened, and from that moment were tender and troublesome. Since using the dam for each case I am spared that experience, and yet I have discarded my former custom of leaving every devitalized tooth open for at least twenty-four hours.

The use of the dam is not the only factor, but its use is an important reason why in modern treatment one does not have trouble by sealing the canal at once. Before applying the dam, paint the gums, using a wisp of cotton on a wooden toothpick, with a mixture of iodin crystals in benzine to which has been added 20 per cent. of menthol. This preparation, which has been recommended for painting the gums before using the hypodermic needle, not only disinfects, but prevents sensation.

IMPORTANCE OF GAINING FREE ACCESS TO CANALS.

The next and perhaps most common error is in not opening the crown of the tooth sufficiently to gain access to the pulp chamber and get the proper direction in which to approach the canals. Distal cavities in bicuspids and molars, and labial cavities in bicuspids, cuspids, and incisors are quite impossible to use, because they are not in line with the end of the canal, though I have seen many cases where such cavities were utilized. Openings in direct line with the canals must be established, even if the tooth has several fillings or cavities on other surfaces. Occlusal cavities in bicuspids and molars should be large, so that delicate probes may pass freely and directly into the canals without bending or binding.

Direction to the canal openings having been secured, it is sometimes necessary to ream with the drill one side of the canal to get direction for the deeper part, but this should be done with great caution, and only with radiographic proof of the side to be reamed.

In my opinion, reaming with the engine drill results in more harm than almost anything else. It may do harm in four ways: (1) One loses the sense of touch; the guiding walls are gone which might lead a probe or a Kerr file to a continuation of the canal. (2) Chips from the reamer may so block the canal as to make it almost impossible to proceed, and to convince one who has not an X-ray proof, and especially one who does not count as regular procedure the finding of the apical foramen, that the end of the canal has been reached. (3) The reamer may start a false lead. In the hands of the careless, it may plunge through the side of the root, but even in the hands of the most careful it can easily go too far. If at some bend the point makes a depression to the fraction of a millimeter, everything else from that moment, whether drill, file, probe or broach, seems attracted to that small pit as to a magnet, and further progress becomes difficult. Undoubtedly many operators, who do not prove their progress with the picture, and who do not attempt to find and fill the foramen, accept such a preparation as complete and fill to that point, leaving the balance uncared for. (4) Reamers of large caliber may so thin the root as to render it very frail. X-ray films sometimes show a shockingly near approach to the side. One of the things which impressed me most in the magnificent work of Rhein was his exceedingly small root-canals. I do not feel that I have yet acquired sufficient skill to fill such small canals, but enlarging with Kerr files leaves an infinitely smaller canal than I have for years been accustomed to.

I have had excellent results in removing pulps with conductive anesthesia by the Fischer method, also with pressure anesthesia, and when using the latter method I find a seven-minute application of cataphoresis a wonderful aid in making the exposure of the pulp painless. It is a mistake to apply pressure after the pulp is exposed until the decay has been removed and the cavity thoroughly disinfected, and yet how many times have teeth come into my hands for treatment where this normal precaution had been neglected.

I am not wholly convinced that it is a fault to use arsenic, but with modern methods of painless dentistry it is unnecessary, and therefore I have discontinued its use.

After the pulp is removed it would be a mistake *for me* to fill at once. I use no adrenalin, preferring free bleeding. After that has ceased I remove clots with paper points, and wipe out the canal with hydrogen dioxid. If the first operation removes all the pulp, and fine probes pass through the foramen, I leave a paper point or a simple dressing in the canal, and fill at the next sitting. If the fine probes do not pass through the first time, the next operation consists in getting them through, at which time sodium-potassium, best carried on a Twentieth Century apexographer, may be used.

USE OF SODIUM AND POTASSIUM.

If a putrescent pulp is to be removed it is a mistake to use any pressure which can force any of the contents through the foramen, therefore a fine broach is to be used at first. As soon as enough material is removed to establish a good opening, I consider it correct to use sodium-potassium to render negative the remaining contents as soon as possible. This can be neutralized from time to time with Marchand's hydrogen dioxid, which is somewhat acid.

I consider it essential to neutralize thoroughly any powerful remedy at the end of the sitting, therefore I use 40 per cent. sulfuric acid if any considerable amount of sodium-potassium has been used, and neutralize that with sodium bicarbonate. Only experience can determine when a sufficient amount of the dioxid has been used, but if at a later treatment the strong characteristic odor due to the sodium-potassium is present, I consider that I have failed in my treatment, and that the tooth has been over-exposed to a powerful dissolving action.

I have ceased sealing powerful drugs in the canals, but instead use a paper point or sometimes a dressing recommended by Dr. Buckley consisting of menthol 2 grams, thymol 3 grams, and Merck's eucalyptol 1 fluidram. I have left sodium-potassium in stubborn roots in which calcification had taken place, but it was a mistake, for I had a perforation in one case at a point which I know could not have been caused by an instrument. I do not criticize as wrong the use of formocresol, but it should not be carried well into a canal unless the operator has successfully blocked off the canal with chips from reaming. The originator recommends its use in the pulp chamber before the contents of the canal have been removed, and that certainly is all right.

OPENING CANALS IN WHICH CALCIFICATION HAS TAKEN PLACE.

Calcified canals are our greatest problems, and to get through them without perforating the side of the root requires great patience, as well as skill. I wish to say right here, however, that it is a mistake to perform that tedious operation on a root which is comfortable, and where a radiograph shows no bone rarefication at the apex. It is wrong, however, to jump to the conclusion that a root is filled with calcified material just because one cannot easily enter it. I have frequently worked more than an hour on a seemingly solid canal, and have been rewarded in the end by finding a good opening and a good lead. Secondary dentin from a receding pulp may obstruct our passage, and we must pass through this for some distance before we have a right to assume that there is no open canal beyond.

It is undoubtedly true that many canals are left from one-fourth to one-third full of living pulp tissue, the operator having successfully blocked the way with chips from his reamer, innocently believing that he has reached the apex. Sensitiveness is easily explained to his mind and to the satisfaction of the patient on the assumption that he has reached living tissue beyond the apex. A treatment of carbolic acid, and later chloro-percha with a single gutta-percha point, completes a rather comfortable operation, and doubtless in many cases the patient has years of comfort. What is the condition, however, at some future day subsequent to the death of that remaining bit of pulp? In some instances, I do not doubt, granulation followed by fibrous tissue, and that by bone, may fill that canal—a healthy, perfect operation, due to nature's wonderful recuperative power, but I fear the percentage of such cases is small, and that a degree of infection and loss of bone is the more common result. The radiograph reveals to us these areas of lost bone, and root amputations have not only confirmed the pictures, but furnished us material for microscopical examination which has told the rest of the sad tale—a focus of infection.

Perhaps the saddest aspect of the whole matter is the fact that such a rarefied bone area may exist and a granuloma form without causing sufficient disturbance to annoy the patient. Have we as dentists the right to ignore these conditions? The passage of the streptococcus viridans may not have been actually traced through the blood stream to the poor twisted arthritic joints, but does that absolve us from the duty of removing and endeavoring with all our might to prevent such conditions?

One of the chief aids of the radiograph is in showing our progress in canal work. I have a piece of platinized gold wire, the same as used for orthodontic arches, drawn to hairlike fineness, and by placing a piece of it in or through the canal, a radiographic picture will show me what I need to know. Many a time when I believed the wire to be well through the foramen I have found it only inside of an unusually long canal. By measuring the wire and the photograph of it one can determine whether the picture of the root has been foreshortened or lengthened. Checking up one's work in this way leads to improved technique in radiography.

FILLING ROOT-CANALS.

I cannot close without saying something about the filling of root-canals; in this, grave mistakes are also made. One cannot fill a root-canal with a dry gutta-percha cone, though I have known it to be attempted. Gutta-percha solution should not be too thick, because it will block the way, or in large canals with large apical foramina it may be pushed through the apex bodily in unnecessary bulk by the gutta-percha points which follow. I have my solution so thin that a probe dipped into it will show small globules running down the side. I have ceased using powerful drugs in my solution, but am very particular about keeping it pure. The bottle and gutta-percha are both sterilized before making the solution, and no instrument that is not sterile goes into it for any purpose. Before filling I ionize every canal which has a history of infection, but consider it superfluous when a vital pulp, with no infection, has been removed.

It is a mistake to attempt to fill a canal with a single cone, for in only rare instances can it be made to reach the end.

After the solution has been well pumped into the canal with a smooth broach, a small gutta-percha point (No. 11 or 12) can be inserted, and with a plugger fine enough to reach the end of the root can be *led* to place.

The operation is not unlike that of introducing a fine cotton dressing. No one would attempt to push a cotton dressing, but a delicate smooth instrument will catch it almost at its tip and lead it to place. Just so it is with the gutta-percha point. After the first one has been well packed others follow in the same way, care being exercised to absorb the chloroform by packing the points as hard and dry as possible. One should not hesitate, however, to moisten afresh with the solution, or even chloroform, as subsequent packing hardens the mass. Do not expect to fill a canal in a few minutes. Experienced root-canal operators often require more than two hours to fill the canals of one tooth, even with the assistance of the radiograph.

After the canals are filled, make a radiograph, and explain to your patient that you hope to find the canals full, but that you cannot know until you have the picture; and that if they are not full, you shall surely fill them over again. If you have to do it again, the patient will then have respect for your conscientious carefulness instead of a suspicion that you are not very skilful.

ASEPSIS.

In conclusion, allow me to say a few words with regard to *asepsis.* The whole trend of modern surgical treatment has been toward an ever-increasing observance of aseptic methods and decreasing use of antiseptic remedies, due to the destruction of tissue caused by antiseptics—and I believe we can well profit by the experience of surgery.

Absolute asepsis is difficult in dental practice, but we should strive to come as near to it as possible. A man may keep his clamps in lysol, and after applying the dam paint it with iodin, follow that with alcohol, and wash the tooth with alcohol; he may then spend ten minutes washing and disinfecting his hands, and upon approaching his work, pick up an engine handpiece or chip-blower, thus nullifying all his efforts at asepsis. He may work with a napkin over his nose, rubber cots on his fingers, and then touch a knob to open his case or a bottle of some remedy, and again asepsis is gone!

The bracket table should be of washable substance, and cleansed with alcohol before each operation. Instruments for canal work, including the wire brush for cleaning broaches, should have been recently sterilized. During canal preparation I have a small glass of fresh dioxid on my table and every instrument is dipped into it as soon as it comes out of the tooth, so that it shall not be a source of contamination on my table.

I approach the operation of canal filling with awe. All instruments I am to use go into the sterilizer in a napkin, and are laid on the table in the napkin. The table is wiped with alcohol. Gutta-percha points are dipped in alcohol. Formaldehyd 10 per cent. is used for that purpose, but I fear it. I wash my hands with chlorid of lime and sodium carbonate equal parts. This is hospital procedure, and though it sounds harsh, it leaves the hands soft. It should be well rinsed off. I then make it a point not to touch anything which could contaminate the aseptic condition established. The nurse holds my bottles of solutions of alcohol and chloroform as I require them, and though not surgically aseptic, she is spotlessly clean, and the bottles she holds are regularly cleaned with alcohol.

I have indeed painted a dark picture in the beginning of my remarks. I was like a person nearly blind, given glasses which showed a world of things until then hidden, but it would be unfair and misleading not to tell you that my work has become immeasurably easier, because now I know where I am going, and my speed has increased accordingly. One oft-expressed fear on the part of men who have not an X-ray machine, that it will increase the difficulty of their work, is unfounded and unreasonable.

After once becoming accustomed to the convenience, I have never been tempted to discard my X-ray machine.

8 West 40th st.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

What Dentistry Has Done in the Present War in Europe.

By HERBERT L. WHEELER, D.D.S., New York, N. Y.

(Read before the Northeastern Dental Association, Hartford, Conn., October 11, 1916.)

THE title of this paper is a large one. I can hope to give but a synopsis of the work contributed by the dental profession toward the welfare of the men involved in the present war in Europe.

In the first place, mention must be made of the work done by dentists toward the dental welfare of many thousands of soldiers. This work was necessary before these men could pass the government requirements for service in the army.

The age limit being sufficiently restricted to reduce consideration of pyorrhea cases to a minimum, the energy of the profession was concentrated upon the question of repair and replacement of teeth, the aim being to give every man the proper amount of masticating surface to enable each individual to effectively chew his food.

This requirement of a minimum number of teeth suitable for masticating purposes was recognized in all the belligerent countries. The knowledge that without sound teeth mastication is ineffective seems to have at last been impressed upon the minds of the authorities in all these countries. Knowing this, they were able to foresee that soldiers without a reasonably complete equipment for masticating purposes would soon become inefficient.

The knowledge that food improperly triturated before swallowing would give rise to disorders of digestion seems also to have been realized by the civilized world. It is now known that it is essentially the vegetable portion of our food that demands thorough chewing, and an army in the field cannot be rationed entirely on meat.

The countries involved in the war have come to realize that mastication is all-important if health is to be preserved and maintained at a proper standard for military service. They also realize that proper mastication is difficult or impossible if the teeth are defective.

The logical result of the situation was that men whose teeth were defective were placed in the hands of the dentist for the purpose of making their chewing apparatus effective. This, therefore, is the reason why at the beginning of the war the call upon the dentists of Europe for assistance was imperative and exacting. Nor was the call unheeded! In college infirmaries, in dental clinics, and in private offices, the dental profession of France, England, Germany, and other countries set to work to help put the fighting men of their country in a condition to successfully withstand the hardships of a military campaign.

That these efforts of the dentists have borne excellent results is manifest by the fact that, in France and England at least, the loss of men through disease is less than it has ever been in the history of those countries—I think in the history of warfare.

But the efforts of the dental profession have not stopped with the putting of the mouths of these fighting men of Europe in order; they have provided for and *are* maintaining them in order. Dentists of both France and England are at the front in large numbers, looking out for tooth defects and remedying them. This has contributed immensely toward not only the efficiency of the fighting unit, but to the retaining of larger numbers at the front.

The value of even simple dental service such as the filling of teeth and the inserting of artificial teeth to replace lost ones has become evident.

It is doubtful if anyone from the most humble private to the general in the armies in France will ever again question the value of the dentist's contribution to the health and welfare of the army.

I speak more of France and England because I have seen evidences of the work being done by the dentists of these countries. I understand that similar work is being done in Russia, Italy, Germany, and Austria.

While the work I have mentioned forms in the aggregate by far the greatest volume of service done in the present war, it is not all, nor is it the most notable and brilliant.

I have cited some of the reasons why dentistry is becoming valued at its true worth as an agent contributing to human welfare. Its greatest victories in the present conflict are not, however, what it has accomplished in repairing and replacing teeth, nor in its teaching of the men in the trenches the necessity of cleanliness of the mouth and teeth.

The value of the dentists' service to their country in this work may not be computed in coin. It has been a noble and patriotic service and should not be underestimated. And the pain relieved in cases of aching teeth can only be appreciated by those who have been the recipients of this service. All this the profession has been doing for years, faithfully and well, without regard to the appreciation of the public.

THE REMARKABLE RESULTS OBTAINED IN ORAL SURGERY AND DENTAL PROSTHESIS.

It is in the field of oral surgery and dental prosthesis combined, that the new and wonderful work has been accomplished. It is doubtful if ever before in the history of the world results have been achieved such as have been attained by the co-operation of the plastic surgeon, the oral surgeon, and the prosthetic dentist, in the repair of mutilated and disfigured faces of soldiers in the present war. The effect of gunshot wounds, wounds from shrapnel, hand bombs, and bayonet cuts are severe and shocking in the extreme. It is no exaggeration to say that jaws are torn away, faces crushed in, eyes shot out, noses torn away, and whole faces torn and shattered into most revolting and pitiable conditions. It is in these cases that the service of the dentist in the department of oral surgery and the prosthetist in making new and unheard-of appliances has been little short of miraculous.

The mandible and maxilla are not only fractured, in many cases, but the bones are shattered into small fragments, the teeth driven about with such force that they themselves make serious wounds, and are as difficult to locate and remove as shrapnel or bullets. The lower jaw is sometimes crushed at the symphysis so that the teeth of both sides are brought close together, the rami in some cases touching each other.

There are few simple fractures; there may be one, two, or a dozen points of fracture—the more there are the more difficult is the treatment. In the past anything that would obtain a healing of the fractured parts was considered a success, and the task of bringing the displaced parts back into their normal position was considered impossible. It was considered fortunate if sloughing of the parts and loss of some of the bone did not occur, and it often *did* occur. Necrosis, with sequestrum and exfoliation of the parts, was more common than not. Unfortunately, in the present war there are oral surgeons who are satisfied with merely bringing the fractured parts together, if healing can thus be secured. In adopting this treatment the relation of the mandible and maxilla to each other is ignored, as is also the facial appearance after the wound has healed.

To the glory of the American and French dentists who are serving in the present war this policy has not been followed by them. They have kept steadily in mind the fact that the future welfare and usefulness of the individual depends upon two factors: First, the necessity that the teeth in the mandible and in the maxillæ be restored to a reasonable occlusion sufficient for proper mastication, and where teeth are gone, that the bone and process be so restored that artificial substitutes can be placed thereon. Second, that the face, mouth, and general appearance be restored to as near normal as possible. To be left with a mutilated and horribly disfigured face after giving one's all to his country is a misfortune too horrible to contemplate.

The American and French dentists in France have realized this, and they are doing everything within their power to obviate it.

The dentists realize that to reduce the mutilations and disfigurements of the face to a minimum, the underlying structures must be retained, and if lost, regenerated or replaced when possible.

In their efforts to conserve shattered and mangled bone they have succeeded in maintaining life in many fragments of bone, and in securing most remarkable bone regeneration from these fragments. This is the more wonderful when we consider that new bone can only be built when there is living periosteum.

When large portions of bone are gone, bone-grafting has been resorted to, with a fair percentage of success. In order to have bone regeneration or successful bone-grafting, among other requirements is the one that the parts must be kept rigidly immovable. To accomplish this, the skill of the prosthetic dentist has been taxed to the utmost. The appliances that have been originated and utilized are marvelous in the extreme. I shall not endeavor to describe them, for I have not the models or appliances. A word description would be inadequate, as one needs to see these cases.

THE VALUABLE DENTAL WORK DONE IN THE AMERICAN AMBULANCE AND IN OTHER HOSPITALS IN PARIS.

The total benefits that dentists in these fields have contributed toward the welfare of their country and humanity will never be known or told. My admiration for what they have accomplished is greater than I can find words to express. The world has become their debtor. I was moved to say more than once, when I saw the wonderful results that have been and are being obtained at the American Ambulance, the École Dentaire de Paris, the Val de Grâce, the greatest military hospital in Paris, Lycée Michelet, and the small but beautiful Spanish hospital, "In the past the world has come to America to learn dentistry; now America must go to France." Every American who possibly can should go and see, and give help if able. We cannot afford not to go, for to go is to be prepared to serve our own country in an emergency—an emergency that I feel is sure to come. Those who cannot go should read carefully all reports obtainable, such as those published in the DENTAL COSMOS by Dr. Geo. B. Hayes, the head of the dental service of the American Ambulance at Neuilly. Those who can read French should read the reports in *l'Odontologie,* published at l'École Dentaire de Paris, and the *Journal of the British Dental Association,* published in England, as well.

There are many centers in France where general dentistry is done for the soldiers besides the several in Paris and the one at Versailles. They are located at Rouen, Le Mans, Orleans, Châlons-sur-Marne, Besançon, Névers, Angers, Rennes, Nantes, Augoulême, Clermont-Ferrand, Lyons, Nice, Montpélier, Toulouse, Bordeaux, Nancy, and Chaumont.

The centers where face restoration is done are as follows: Paris, Val de Grâce and annexes, Neuilly (American hospital), l'École Dentaire de Paris, Lycée Michelet, and the American Face and Jaw Hospital. Outside of Paris there are centers at Rouen, Le Mans, Bourges, Angers, Renne, Limoges, Royat, Lyons, Marseilles, Montpélier, Toulouse, Bordeaux, and Nancy.

This gives you an idea of the extent of the work being done in France. With all this, and more, being done at present, however, the need is greater than the service can accommodate—and will be for some time to come.

The work done by such Americans as W. S. and I. B. Davenport, Geo. B. Hayes, J. H. Spaulding, D. Hally Smith, and others; by Dr. Godon, Geo. Villain, L. Frey, H. Villain, Roy, Choquet, Pont of Lyons, and many other Frenchmen, should fill us with gladness that the dentists of Europe, American and native, have risen so magnificently to the requirements of the occasion. This should be an inspiration to us to strive to carry the standard of American dentistry still higher.

I rejoice, and I think we all do, that our profession has shown its ability to meet successfully this great emergency, and that the world has come to a realizing sense of the value of a clean mouth and teeth and an efficient masticating apparatus kept effective by constant vigilance.

If we cannot share with our *confrères* in France their duties and responsibilities by serving with them, let us at least render all the help we can, and assist them in their noble and self-sacrificing service by money contributions whenever possible.

560 Fifth ave.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

Anchorage of Alloy Fillings in Badly Decayed Teeth, and the Use of the Matrix.

By W. S. PAYSON, D.D.S., Castine, Me.

(Read before Northeastern Dental Association, Hartford, Conn., October 12, 1916.)

IF fillings are to preserve the usefulness of teeth they should be put in to stay the maximum length of time, and to that end they must have anchorage sufficient to secure them.

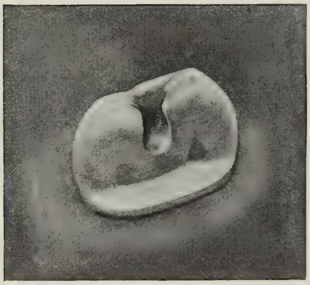
This anchorage should be obtained in badly decayed teeth by cutting away the least amount of tooth tissue possible. The filling should serve at least three purposes—(1) to stop decay, (2) to serve as a part of the masticatory surface, and (3), which is not the least, to protect the gum at the interproximal space. And this means that the filling should be contoured to the original shape of the tooth or to an over-contour, having the filling touch the adjoining tooth with a rounding, smooth surface about one-third the distance from the morsal surface to the gingival portion, in order to prevent fibrous foods from wedging into the interproximal spaces and impinging on the gums. To me, this protection of the gum is one of the most important duties we have to perform in dentistry.

How can we anchor fillings in badly decayed teeth so as to give this extreme contour when needed, and also conserve the maximum amount of tooth tissue? The following method has been used by me since 1888—twenty-eight years—for alloy fillings in approximal surfaces in bicuspids, molars, and in distal surfaces of cuspids where needed.

A large approximal cavity in a bicuspid should have the decay removed, leaving all the dentin possible for support on the buccal and lingual surfaces, with a step at the gingival portion and with the sulcus leading from the cavity cut out not wider nor deeper than the diameter of 15-gage wire, unless decay compels a more extensive cutting. The portion of the sulcus farthest from the cavity should be made sufficiently large to receive one head of a double-headed rivet, the sulcus serving as the anchorage for the filling, and the rivet keeping this small mass of the filling from breaking away, the other head of the rivet being embedded in the filling proper after the manner of reinforced concrete. (Fig. 1.)

These rivets are made from gold-plated, hard-drawn brass wire of about 23-gage or a trifle smaller. These can be obtained at jewelers' supply houses; an ordinary pin is two or three sizes larger than is needed.

FIG. 1.

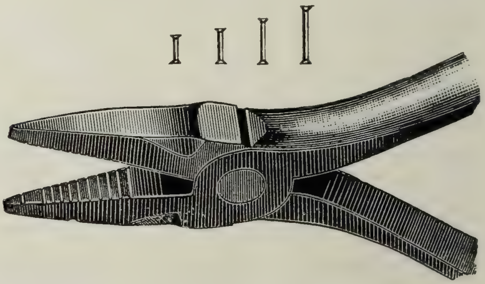


In fillings where great stress is likely to be brought on the anchorage we use 21-gage wire for the rivets, but in 90 per cent. of cases 23-gage wire is large enough. These should be kept in stock, made up in assorted lengths from the sizes of wire mentioned. To make these handily one can use a cheap pair of 5-inch pliers and file the points tapering so they will be less than one-sixteenth of an inch at the points, beveling the inside edges of the jaws. Nicer rivets can be made by having the inside of the jaws of the pliers grooved. This can easily be done by taking a small needle, drawing the temper slightly, putting this needle in the pliers, and giving the beaks a sharp blow with a hammer. The grooves thus being opposite each other enables one to easily grasp the wire, and the wire will not be so apt to bend when being headed. (Fig. 2.)

One end of the wire can be headed in the vise with the aid of a very light hammer, then the wire is grasped with the pliers, close to the head, the wire cut off, and the other head made while the wire is held in the pliers. (Fig. 2.)

To make a long rivet, the wire is grasped near the joint of the pliers; to make a short rivet the wire should be grasped near the points. Beveling the inside of the pliers as mentioned above enables one to make a better head on the wire; filing the end of the wire straight across before hammering also facilitates the making of a good head on the rivet. The office girl can be taught to make these rivets.

FIG. 2.



VALUE OF THE MATRIX IN INSERTING AMALGAM FILLINGS.

To get the contour and also to make a dense filling that will not slide away from the tooth it is necessary to use the matrix; this also makes it easier to finish the filling. We use the matrix in 95 per cent. of all approximal cavities filled with alloy, and with many gold fillings. The matrices are made from very thin soft steel, No. 36, sold by the supply houses. (Figs. 3 and 4.) This steel is cut into a dozen or more pieces of different lengths and widths, with a smooth hole in each end for the reception of a ligature and with the gum edges of the matrices rounded at the corners. These can be used over and over after passing them through the flame to sterilize. To me, a ligature of large waxed floss silk, such as is sold by the S. S. White Co., used in connection with a very narrow wedge close to the gum, is the best method for holding the matrix in place. (Figs. 3 and 4.) If the dam is used, the Ivory clamp is good for holding the matrix.

To use the ligature I take a one-foot length and thread one end through the hole in the matrix that comes on the palatal side of the tooth, tie at the middle of the ligature, then put the other end of the ligature through the other end of the matrix. The matrix is now slipped into place with two ends of the ligature passed around the opposite sides of the tooth and tied, bringing the knot on the buccal side; then slip in the narrow wedge close to the gum. If the wedge is not narrow it flattens the matrix at the knuckling point, and spoils the contact point. These wedges can be quickly made of round hardwood toothpicks—which, by the way, are useless as toothpicks. I then tie the ligature several turns around the matrix and tooth, tying with a surgeon's knot each time. After the matrix is in place the operator should see if the margins of the cavity can be bettered, as they show better with the matrix in place, and can readily be reshaped.

FIG. 3.

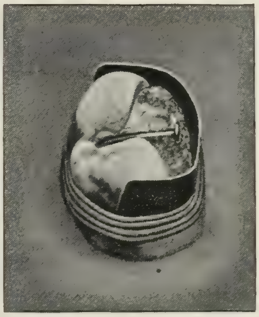
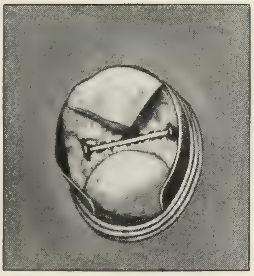


FIG. 4.



After the alloy is mixed it is made into a long roll with pointed ends. It is now placed on a piece of chamois, and each end cut off, making two pointed cones. The central portion is again rolled, pointing the ends, and two more cones cut off. With an Elliott amalgam carrier these cones can be carried easily to the cavity, and the pointed end makes it easy to enter.

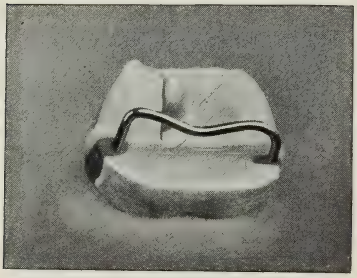
After the cones are placed in the cavity and condensed, the remainder of the alloy can be easily placed. We use a pellet of bibulous paper to help condense the amalgam, as taught by Dr. Bonwill. When the cavity is nearly full, a trench is made through the soft filling to the end of the sulcus, and the rivet placed in sufficiently deep so that it will be completely covered with amalgam, one end being in the enlarged end of the sulcus and the other at the opposite side of the filling. These rivets should be employed as long as the filling will permit; the filling is then finished, covering the rivet. (Fig. 3.)

This makes a positive anchorage in the part of the tooth where the greatest stress comes and in the strongest part of the tooth. The smallest possible amount of tooth structure is sacrificed for anchorage, and very little extra time is consumed in obtaining this strong anchorage.

EASE OF REPAIRING AN AMALGAM FILLING IF DECAY RECURS.

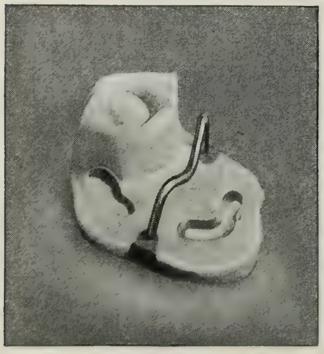
If decay recurs on the buccal, palatal, or gingival side of the filling, it can be repaired without disturbing the original filling in most cases, for we know that the anchorage is not involved—as it is in the ordinary method of anchoring. When both sides of a bicuspid are involved, prepare each side and cut out the sulcus as little as possible, after removing the decay, just enough to receive the rivet. The matrix is extended around the tooth and is nearly filled; a trench is made through the sulcus and across both fillings. As long a rivet as possible is placed in position and the fillings are finished, thus utilizing each filling as an anchorage for the other. (Fig. 4.)

FIG. 5.



If the sulcus is used for anchorage in an approximal filling in a bicuspid, and then afterward a cavity occurs on the other side of the same tooth, place a wedge between the old filling and the adjoining tooth to steady the filling, and with a sharp spear-pointed drill cut out the sulcus and extend across the old filling; prepare the new cavity and fill, using a long rivet extending from the distal side of the old filling to the distal side of the new one, thus making one filling hold the other.

FIG. 6.



Similar conditions in molars are treated the same way. Sometimes molars will decay in such a way that the pulp is well covered, but with only a small part of the crown left. These can be built up by cutting a groove on each side in the direction of the long axis of the tooth—not opposite the bifurcation, however—anchoring in the tooth a staple with headed points one in each groove and bending the staple so that it will not interfere with occlusion. Fill in over the ends of the staple with a quick-setting amalgam, placing the matrix around the entire tooth, and after the alloy has hardened somewhat, fill as a simple cavity. (Figs. 5 and 6.)

When properly done this is a positive anchorage, and I know of restorations that have been doing good service for twenty-five years.

AMALGAM IN COMBINATION WITH OXYPHOSPHATE.

Line all large cavities with oxyphosphate, to protect the pulp, to strengthen weak walls, and to retain the original color of the tooth; this should be done, however, before placing the matrix in position. A good way to line cavities is to place the cement in the cavity, then press it home with a pellet of unvulcanized rubber, holding it in place until it begins to set. This insures the lining touching all walls and avoids air-spaces.

In some cases where a molar is badly decayed, two short matrices tied together on the lingual side will fit around the tooth better than will a single long matrix. The patient can sometimes help by closing the opposite teeth against the matrix when it is being tied in place, and sometimes placing the wedge lightly before tying the first knot will help.

In using a matrix that extends completely around a bicuspid and is somewhat longer than the perimeter of the tooth, thread the ligature through only one end of the matrix, allowing the ends of the matrix to overlap.

If a quick-setting alloy is used—*i.e.* Twentieth Century or Fellowship—the matrix can be carefully removed within five minutes, and the filling finished to a considerable extent, though of course it is always better to polish the filling finally after the amalgam has completely set.

An illustrated description of this method was published in *Items of Interest,* in 1905, page 650, and also in the *Dental Digest* of the same year.

This method of anchorage has been worth literally thousands of dollars to me, for it has enabled me to make fillings stay where other dentists have failed with the usual methods in the same teeth; and patients are inclined to blame or praise a dentist according to his results.

[See also *Discussion,* as reported under "Proceedings of Societies," this issue.]

What Should Be Our Attitude Toward the Medical Profession?

By HERMAN AUSUBEL, D.D.S., Brooklyn, N. Y.

WITH the agitation of recent years regarding the relation of apical infection to systemic lesions, the difficulties of the problem of our relation to the medical profession are becoming more pronounced every day. Should we look upon medical men as a superior authority in dental matters, and calmly submit to their prescribed orders as a druggist is expected to do, or should we have them to understand that, as specialists in our particular field, we are as well qualified to give expert judgment as any specialist in any other branch of medicine is presumed to be; that our judgment and knowledge with regard to pathological conditions of the oral cavity are entitled to proper consideration, and that while we are willing to co-operate with the medical profession in the effort to get at the root of the trouble with the view to ameliorating and eliminating certain pathological conditions, we must decline, as a profession, to condescend to obey orders—particularly so while the medical profession as a whole displays such great ignorance in purely dental matters.

The following cases that have recently presented for treatment will throw some light upon this subject:

Case I. A woman about forty years of age came to my office, asking me to extract all roots and teeth on her physician's "orders." She is suffering from rheumatism, and he thinks that her teeth are the cause of her trouble.

Upon examination I found the upper jaw without any roots or teeth; the lower jaw had a few roots and the four incisors, sound and healthy, except for small approximal cavities. I advised the patient to have all the roots extracted, the small cavities in the incisors filled, and thus retain them so as to help hold a lower plate in position, which is very difficult to do when no teeth are present. After having the roots extracted, she returned to her physician, telling him what I had advised, and he became furious. He then ordered her to come back to me and insist that I should take radiographs of these teeth, as he was sure that they should be extracted. Whereupon I explained to the patient that it was absolutely silly to radiograph these teeth, as they were vital, with healthy pulps and gums and giving no discomfort whatever. I further told her to tell her physician that in dental matters my opinion was more important than his; that while I was willing to co-operate with him and give him my opinion of the case upon a courteous request, I must positively refuse to take orders from anybody.

Case II. A girl patient of nine years

came with her mother to my office crying hysterically to have a four-tooth bridge removed that I had inserted for her two years previously. A medical professor ordered her to have the bridge taken off immediately, as being surely the cause of her severe neuralgia. She had been suffering for quite a while from neuralgia, complicated with a gradual loss of hearing in one ear. All treatment was of no avail. Finally the physician looked into her mouth, and lo! he discovered a suppurating condition around one of the crowned teeth, which he thought had abscessed. He ordered her to have the tooth removed immediately.

Upon examination I found the bridge in perfect condition, the gum above the crown having about it some grayish white food débris due to neglect of cleanliness, which caused a little recession of the gum and a gingivitis. There was no abscess or pus condition whatsoever; the food débris had been mistaken by the professor for pus. I then wrote to the professor telling him that in my opinion it was unnecessary to remove the bridge; that there was no abscess present, the teeth being vital, that there was only a slight gingivitis due to the accumulation of food around the neck of the tooth, which he mistook for pus; that I had given proper instructions for cleanliness, and had prescribed a mouthwash for the purpose.

Case III. A lady about thirty years of age consulted me regarding an incipient alveolar abscess in the superior maxilla.

Upon examination I found a bridge of ten teeth, four of which were gold crowns, the fixture extending from the first left bicuspid to the first molar on the opposite side. The second left bicuspid was also covered with a crown. The abscess was developing in the left bicuspid region. As both bicuspids responded to percussion, I advised her to apply an ice-bag to the cheek to reduce the swelling, and I then ordered a radiograph made to ascertain which one of the bicuspids was responsible for the trouble. I could then drill through the morsal surface of the gold crown, gain access to the root-canal, fill it properly, and fill the outer part of the cavity with gold. In doing this I should save the patient all the expense and discomfort produced in removing the bridge for the treatment of this tooth. The X-ray showed the first bicuspid to be abscessed, and I discharged the patient until the abscess would have time to subside, when I should be able to follow out the treatment outlined.

At the same time her family physician visited her, and noticing her swollen cheek, asked her what she was doing for it. She told him my advice to her. He grew indignant, and told her to go right back to me and tell me that he ordered me to take off the bridge. On her reporting this to me, my reply to her was, that in my office I treated patients according to the dictates of my own judgment; that I took no orders from anybody, particularly from a physician, whose whole knowledge on dental matters comes from a few articles in medical magazines, written by men in the dental profession. It goes without saying that the patient acknowledged my authority in the matter, and followed my advice.

LACK OF KNOWLEDGE OF DENTAL CONDITIONS ON THE PART OF PHYSICIANS.

It is my opinion that the medical profession generally speaking is entirely ignorant of the diagnosis and treatment of dental and oral lesions; that medical men should acknowledge our position as specialists in our particular field, and so regard us professionally whenever they refer cases to us for treatment. The dental profession should do its duty in co-operating with the medical profession in eliminating all possible foci of infection in the mouth that may be factors in producing pathological conditions in other parts of the body, but the *modus operandi* should be left entirely to the discretion of the dentist to whom the case is referred. Physicians do not possess a knowledge of what we understand by proper articulation and occlusion, as is demonstrated by the many cases of fractured jaws that present themselves to us for the after-treatment of deformities of the face and jaw produced by the clumsy and impractical treatment given them by physicians who did not know how to adjust the fractured parts in their normal relations. Many times, indeed, the deformity produced is so marked, and the loss of masticatory function so impaired, that the parts have to be re-broken under an anesthetic and subsequently restored to their normal relations.

Physicians are still treating fractured jaws with a Barton bandage, and by drilling holes through the fractured parts and ligating them with silver wires. I was requested some time ago to lend my dental engine to a near-by hospital for the purpose of drilling holes through a broken jaw. I refused, telling them that dentists have a more humane and scientific way of treating broken jaws with appliances, splints, and ligating opposing teeth together.

A senior student of Cornell Medical College came to me recently, on the advice of his physician, to have me treat his anterior teeth for pyorrhea. Upon examination, I found simply food débris on the necks of his teeth with some subgingival deposits, but there was not the slightest trace of pyorrhea. The doctor mistook food deposits for pus.

Some time ago, a physician sent his mother-in-law to me to have me treat her mouth. At my first glance I noticed a deep ulcer on the tongue, near which were sharp tooth roots. I advised her to have the roots extracted immediately, as they might develop a cancer of the tongue from the constant irritation which they caused. "Doctor," she replied, "this same advice has cost me five dollars. I have had this ulcer for quite a while, and my son-in-law treated it with strong drugs, but it grew worse all the time. He then sent me to a professor for consultation and he told me the same as you are telling me."

I shall cite two more cases, and let the reader draw his own conclusions:

Case IV. A woman, about forty years of age, came to my office for relief from a neuralgic pain of the upper jaw. Upon examination I found that the jaw was edentulous. Her pain was so severe that her eye was constantly watering on the affected side, with shooting pains in her temples, superior maxillary region, and forehead. I advised an X-ray picture, as I suspected an unerupted third molar. She went to a radiologist, but upon hearing the hissing sound of the machine she became frightened and jumped from the chair, and no amount of coaxing would persuade her to permit the taking of the radiograph.

About one year elapsed, during which time I had heard nothing more from the patient, when her husband came to my office for the treatment of his teeth. Upon inquiring as to the condition of his wife, he told me that she had gone to a hospital a few weeks previously and had an operation on the upper jaw, for which she paid ten dollars. Ether was administered, and she had to stay in the hospital for a day or two, but her pain was still as severe as it had been before.

I then requested him to send his wife for another examination. I found a smooth, chiseled surface in the region of the third molar, with no mucous membrane upon it. I could not ascertain with my probe the presence of a tooth, as there was a continuous hard smooth surface of bone. I again advised a radiograph, and she replied, "Doctor, you can do anything you please in this office, but I am very much afraid of the infernal hissing sound of that machine."

I then explained to her that I suspected the presence of an unerupted tooth in her jaw, which might be the cause of her trouble; that if she would permit me I would attempt to remove it painlessly under novocain anesthesia. She gladly consented. After forcing the forceps as far as I could, I was agreeably surprised to find the molar within the beaks of my forceps. About half of the coronal portion had been chiseled off, leaving a smooth surface.

The patient was overcome with emotion upon seeing the tooth, kissed my hands, and paid me five dollars—all the money she had in her pocketbook, telling me that if I did not think it sufficient she would pay me all I wanted. After a few days the pain subsided completely, and her eye became normal.

Now, can anybody explain the reason and object of the operation performed in the hospital? The bone was cut with a sharp knife or chisel, which took off a good deal of the crown portion of the tooth along with the process. Apparently no attempt was made to remove the tooth, as there was no tissue wound, and the bone was as smooth as a piece of glass.

Case V. This is a most remarkable case that came to my notice about three years ago.

A man came to my office and asked me to come to his house immediately, as his wife was in a dying condition. Thinking that he mistook me for a physician, I told him that I was a dentist, and that there were plenty of physicians who would be glad to care for his wife. He insisted, however, that I should come to his house, as he had already had three physicians attend his wife that day, one of whom had suggested that a dentist should be consulted.

Arriving at the house, I found his wife in bed, in a semi-conscious state, under the influence of narcotics. Previous to my examination of the case the following history was related to me: The patient had a third molar extracted about two years previously. Some time after the extraction of the tooth she suffered from severe neuralgia on the same side. Her physician diagnosed the condition as due to a partial dislocation of the jaw as the result of force used in the extraction of the tooth. Whenever she had an attack of neuralgia he would inject morphin, which relieved her temporarily. She then consulted other physicians, paying from three to five dollars a visit, and each prescribed or injected certain forms of narcotics, all of which gave her only temporary relief.

On the day when I was asked to visit her she had such a sudden and severe attack of pain that she wanted to throw herself out of the window. Two physicians were summoned, one after the other; each gave her a dose of morphin, but the pain returned after a while with greater intensity. One of the physicians suggested that if the patient could afford a fee of twenty-five dollars he would recommend a neurologist who might be able to locate the cause of the trouble. The family physician of the patient's parents was then summoned, and he advised that no more drugs be given until a dentist was consulted. Her condition was a source of particular anxiety at this time, as she was pregnant and there was fear of abortion.

I found the patient, as already stated, in bed, scarcely able to answer my questions. Upon inquiry I was told that her pain was of a sharp nature, that it was intermittent, shooting back into the ear, causing an earache and radiating all over the trigeminal region on that side of the face.

Upon these subjective symptoms I immediately diagnosed the case as pulpitis, of the chronic variety, in a lower molar on that side, due to the constant irritation of an exposed pulp. My diagnosis was confirmed when I found a deep distal cavity in the lower second molar on the same side of the jaw. I then removed the food débris present, rinsed the cavity with a tepid alkaline solution, and applied a sedative treatment. The pain disappeared immediately, and on the following day she came to my office for treatment of her mouth. The neuralgic pain did not return again.

Here you have a case of a patient suffering agonies for nearly two years, the physicians being unable to locate the cause of the trouble.

NEED OF CLOSER CO-OPERATION BETWEEN THE DENTAL AND MEDICAL PROFESSIONS.

These are some of my experiences with physicians, and I am sure that every dentist has had similar ones. It is most absurd for a physician to give orders to a dentist regarding conditions of the teeth—as much so as it would be for him to give orders to a rhinologist or laryngologist with regard to nose and throat conditions.

Our dental editors should clearly and unmistakably define our attitude toward physicians, and what their attitude should be in sending patients to us for treatment. It is our duty to educate the medical men in dental matters by contributing articles to medical periodicals which will familiarize them with our work. This should be done not with a view to enabling them to say what we shall do, but that they may more intelligently appreciate our work and be themselves in a position to make a partial diagnosis of mouth conditions before referring patients to us for treatment.

346 Bedford ave.

Report of a Case of Distal Occlusion, Showing Results of One Treatment.

By FREDERICK LESTER STANTON, D.D.S., New York, N. Y.

(Presented before the Eastern Association of Graduates of the Angle School of Orthodontia, New York, N. Y., November 25, 1916.)

IN reporting this case to the Eastern Association of Graduates of the Angle School of Orthodontia I desire to again call to the attention of the members the value of accurately predetermining the movements necessary to change the teeth from malocclusion to occlusion, and to emphasize the exactness with which the teeth may be moved according to plans, when the appliances are designed with due observance of the laws of analytical mechanics.

Fig. 1 (upper) shows models of the case at beginning of treatment, May 1916. Note the complete distal occlusion on the right side. The lower models show the condition in October 1916, after one application of force.

The predetermined arches and appliances were designed by G. D. Fish, C.E.

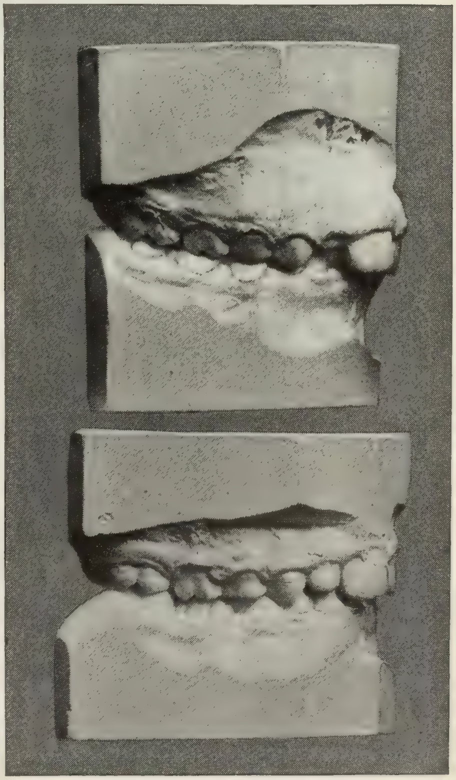
The normal mesio-distal relations on the right side were established without the use of intermaxillary elastics, in one treatment.

Fig. 2 gives occlusal views of the same models, showing the result of one treatment.

Fig. 3 consists of the following charts:

Chart I: An orthographic projection

Fig. 1.



of the cusps, grooves, and incisal edges of the upper and lower teeth. The upper teeth are shown by the dash lines, the lower teeth by solid lines. (Made from the original model.)

Chart II: Occlusion as predetermined by the occlusograph. The upper teeth are shown by dash lines, the lower teeth by solid lines.

Chart III: A composite of the upper jaw, showing—Solid lines, the positions of the upper teeth at the beginning; dotted lines, the proposed positions of the teeth (a copy of the dash lines shown in chart II); dash lines, positions of the upper teeth after one treatment.

Note the extent and direction of the movements.

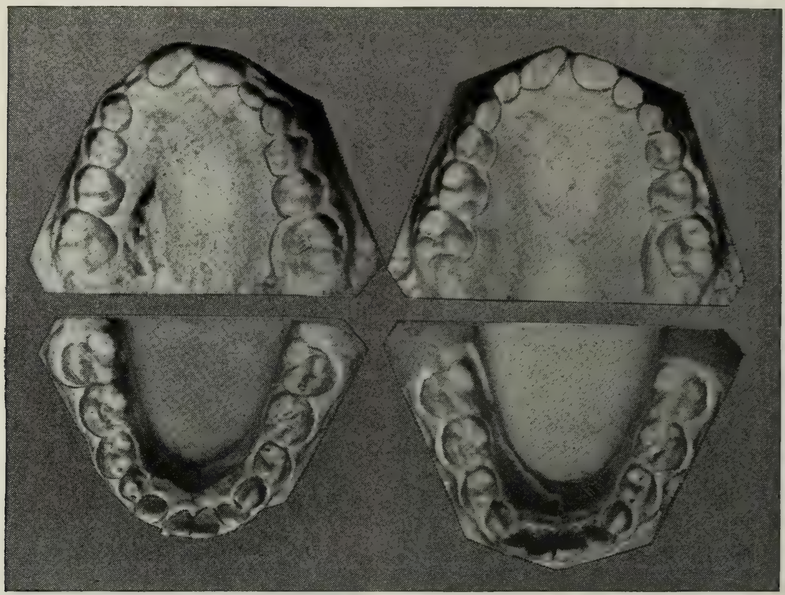
Chart IV: Composite chart of the lower jaw. Solid lines, original positions of the teeth; dotted lines, proposed positions of the teeth; dash lines, positions of the teeth after one treatment.

Note on the left side an extensive buccal movement needed. On the right side the principal movement needed is a mesial one.

The required mesial movement was obtained in one treatment without the use of an intermaxillary elastic.

In Fig. 4, A shows the appliance used on the lower jaw. 1 and 3 are bands cemented to second deciduous molars; 2, band cemented on the right cuspid with ring, 15, soldered to the buccal surface. An expansion arch, 5, was bent to normal arch form for this case and locked, at 4, on the left second molar; at 2, passing through the loop, 15, on the right deciduous cuspid. An extension, 11 (in B), was soldered to the arch, ending in the ring seen at 7 and 12. The arch was continued from this *universal joint* by 13, ending in a special lock at 8, on the right second deciduous molar.

FIG. 2.



By consulting chart IV, Fig. 3, it will be seen that the left side needs buccal movement, and the right side mesial movement. The problem presented was to expand the left side without expanding the right (simply a forward movement). Similar problems to this confront engineers in their work. In order to prevent transmission of bending stress in engineering (for instance, cantilever bridges) hinges are inserted. As we wish to prevent transmission of bending stress in our appliance on the right side, the hinge, 7, is inserted in the broken arch. The location of this hinge at 7 is of the greatest importance, and its position must be carefully correlated with the anchorages 1 and 2, and the form of the expansion appliance, 5.

Fig. 3.

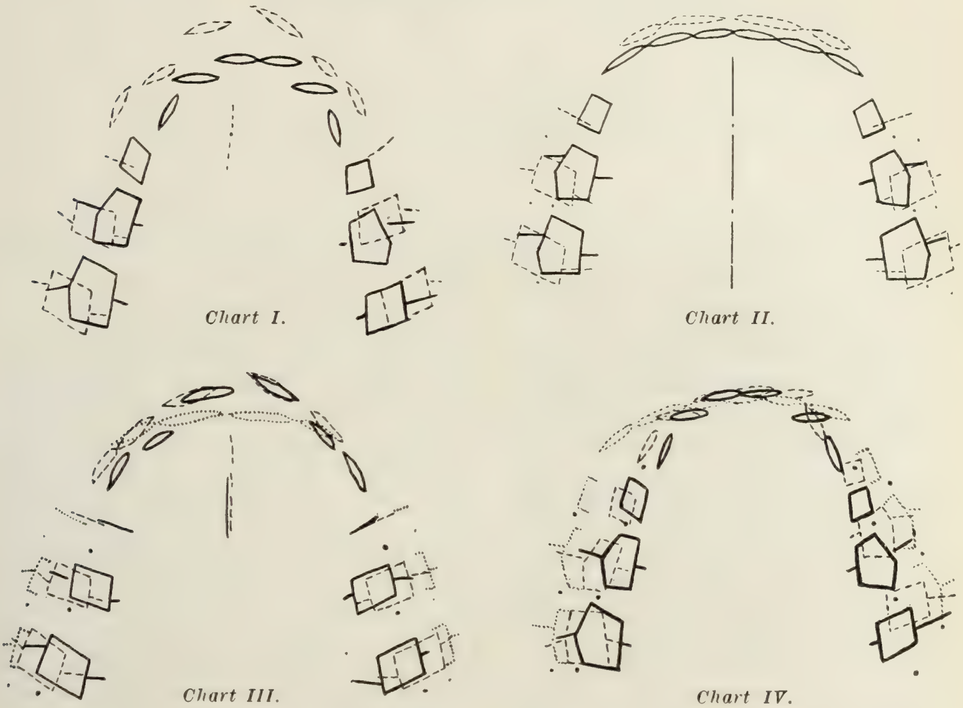
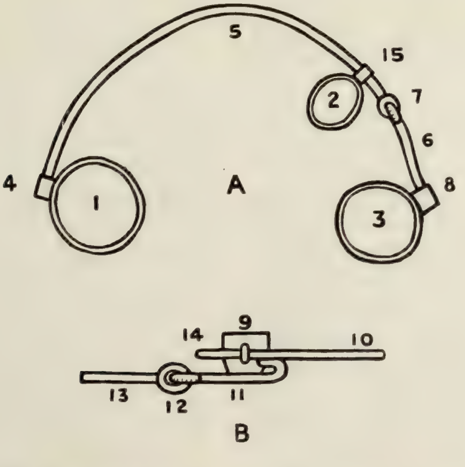


Chart I. Chart II.

Chart III. Chart IV.

Fig. 4.



The appliance used in the upper jaw was the usual expansion arch, as the indicated movements are symmetrical.

28 West 39th st.

CORRESPONDENCE

Co-operation Between Dentists and Physicians.

To the Editor of the Dental Cosmos:

Sir,—Any thoughtful reader of dental literature must be impressed by the fact that dentists are constantly being urged to co-operate with physicians.

I am a member of the younger generation of the dental profession, and I must be pardoned if what I ask is foolish, but —Do physicians ever co-operate with dentists?

Perhaps the citation of a few typical instances may justify my query.

Case 1. A strong, robust man, age forty-eight, was treated for two months by his family physician for indigestion. There being no improvement in his condition, he was sent to the seashore for six weeks. On his return he was sent to a specialist in gastro-intestinal trouble. This physician worked with him for four weeks, and then referred him to a dentist in Philadelphia, who found the patient suffering from pyorrhea alveolaris in its worst form.

The family physician and the gastro-intestinal specialist could hardly be ignorant of the fact that indigestion can be caused by improper mastication of food; they can hardly be ignorant of the fact that bad teeth may be a contributory cause of indigestion, and yet they hesitated to refer the patient to a dentist until every effort on their part had failed.

Pardon my skepticism, and blame it on my inexperience when I say I doubt whether either of these two representatives of the medical profession are practicing ethically, and that they intentionally prolonged their treatment in order to increase the amount of their bills.

Case 2. The patient, in middle life, had been suffering periodically for several years with pain in the upper right side of the face. Her physician reported that the attack would come on every few months, would last for two or three days, and then disappear. The attacks began to occur more frequently, lasted longer, and were considerably more severe. Her physician consulted with a surgeon to decide whether to operate or institute alcoholic injections. And then—and only then—it was suggested that a dentist be consulted.

Is it customary, I feel I am at liberty to inquire, for physicians to co-operate with dentists only as a last resort? Again I say, no physician can be so ignorant of the relationship existing between the branches of the trifacial nerve, and I cannot think the physician in question could have completely overlooked the possibility of dental conditions as the cause of the neuralgia.

I could weary you by citing numerous other cases in which co-operation between physician and dentist did not exist—cases of treatment of abscessed teeth by physicians until septic poisoning required hospital attention; cases occurring daily in my own modest little practice where women in the first month of pregnancy have been forbidden to visit a dentist; cases in which pyorrhea has been treated or its cure attempted by prescriptions—until I cannot but feel that this supposed co-operation between the two professions is but a myth. I mean, proper co-operation. If I am a physician and I treat indigestion until the patient's confidence and finances are exhausted, and then refer the patient to a dentist, I am not co-operating with the dentist in any sense of the word!

In ninety-nine per cent. of cases that I have read about or have had brought to my attention in practice, no voluntary or spontaneous co-operation existed. It was only after all efforts on the part of the physician had failed that a dental suggestion was forthcoming.

And still, physicians come before dental societies and in the loudest tones and with the right hand in the money pocket of their trousers announce that "Dentists should co-operate with physicians to the fullest extent possible."

Yours respectfully,
Chas. Wolff, D.D.S.
1071 St. Nicholas ave., New York, N. Y.

Need for Intelligent Diagnosis of So-called Pyorrheal Conditions.

To the Editor of the Dental Cosmos:

Sir,—In writing this I know I shall be criticized by some if not most of the leading pyorrhea specialists of the country, but I have looked at this subject from all sides, and I think I am justified in my conclusions.

First, I shall take up the time-worn subject of so-called pyorrhea alveolaris. If this term were stricken from our language we might be able to establish some definite foundation from which to diagnose and treat the diseases which are classed under this general name, but as long as the dental surgeon calls anything from a simple gingivitis to a suppurating periodontitis, pyorrhea, then we can never be definite as to diagnosis and treatment. I do not deny that a case of simple gingivitis can be cured, but when suppuration of the peridental membrane has occurred and part of the membrane has sloughed out, leaving a pocket, the only cure is either extraction of the tooth or removal of the pocket by surgical methods. By this I mean cutting off the flaps of the pocket, the result of the degeneration and sloughing of the peridental membrane.

My reason for this is that a physiological union can never be regained between the tooth and surrounding tissues when once it is lost by the destruction of the peridental membrane. The tissues can be drawn up around the tooth until a physical union is obtained by the use of astringents, and the tooth may be held firmly in place, but a true physiological union between the tooth and the surrounding tissues, with the natural mobility of the tooth restored, can never be obtained. And when the attachment between the tooth and surrounding tissues cannot be made moisture-proof, saliva and food will be forced into the space and a reinfection will occur in a few weeks, if not in a few days, due to the bacteria present in the saliva and food.

Any surgeon will tell you that when he uses a metal plate to restore lost tissue he does not get a physiological union between the metal and tissues. He can obtain a physical union which, if it is protected from infection, will give satisfactory results, but if one portion of this physical union be subject to constant invasion of bacteria he would not expect to get any results except unsatisfactory ones.

When the peridental membrane about a tooth, especially one in which the pulp has been devitalized, has been destroyed by pathological processes, forming a pocket, you have a condition similar to that resulting from the presence of a foreign body in the tissues. When the original attachment is destroyed you cannot get a physiological union, only a physical union which will result in reinfection; how then can we expect to get results by the use of various remedies when we are trying to do that which is physiologically impossible?

In my opinion, the pernicious practice of keeping loose teeth in the mouth by the use of astringents is little less than criminal. It is not necessary to mention the systemic effects produced by such teeth; we all know the effects that pus pockets, etc., have on the general health. If, then, the only way to get rid of these pockets is by cutting off the flap of the pocket or extracting the tooth, why does not the profession waken up and give more attention to the prevention of these pockets resulting from the destruction of the peridental membrane instead of looking for a cure for a condition that it is impossible to cure? I do not deny that teeth can be kept in the mouth for years by the use of astringents, but is it of any benefit to the patient?

In closing, I will say that if each stage of so-called pyorrhea were called by a name that would indicate what we are dealing with, we should have some definite foundation for treatment; but when such conditions as syphilitic stomatitis, simple gingivitis, or apical abscesses discharging via the peridental membrane are called by the one name, pyorrhea, and when a single remedy, such as emetin or succinimid of mercury, is exploited as a cure for all of these different conditions, how can we expect to obtain the results we are all seeking!

E. D. Clark, D.D.S.

Rhinelander, Wis.

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Virginia State Dental Association.

Forty-eighth Annual Session, held at Norfolk, Va., April 17, 18, and 19, 1917.

Tuesday—*Morning Session.*

The meeting was called to order by the president, Dr. J. W. Manning, Norfolk, Va., at 10 A.M.

The President introduced the Rev. Geo. D. Estes of Norfolk, who invoked divine blessings on the deliberations of the society.

The next item on the program was an address of welcome to the city of Norfolk by the city attorney, Hon. George Pilcher.

The address of welcome was responded to on behalf of the society by Dr. H. W. Campbell, Suffolk, Va.

The second vice-president, Dr. S. B. Ward, was called to the chair while the president, Dr. J. W. Manning, read his annual address.

The President's Address was referred to a committee consisting of Drs. Harper, White, and Furman, for consideration, with instructions to report at a later session.

Dr. J. P. Stiff, Fredericksburg. I wish to make a motion, if in order, that a telegram be sent to Dr. Kessee by the secretary in the name of the association as follows: "We extend to you the love and affection of your brethren. We feel incomplete without your sympathy and counsel. We deeply regret your absence from among us."

The motion was seconded by Dr. Walker of Norfolk, and carried.

Dr. WILLIAM PILCHER, Petersburg, chairman of the Committee on Revision of the By-laws, presented the revised constitution and by-laws for consideration of the society.

Dr. E. J. APPLEWHITE of Newport News made a motion that the name of the society be not changed. The motion was seconded, and after considerable discussion carried.

On motion of Dr. STIFF, duly seconded, the new constitution and by-laws as a whole (with the exception of the provision about the change of name) were adopted.

A code of ethics, patterned after that of the National Dental Association, was also presented by the committee. It was read by Dr. Pilcher, and on motion, duly seconded, was adopted as the Code of Ethics of the Virginia State Dental Association.

The society then adjourned until the evening session.

TUESDAY—*Evening Session.*

The meeting was called to order by the president, Dr. Manning, at 8.30 P.M.

The first item on the program was the reading of a paper by Dr. ARTHUR B. CRANE, Washington, D. C., entitled "A Call for Standardization in Root-canal Treatment."

[This paper is printed in full at page 777 of the present issue of the COSMOS.]

DISCUSSION.

Dr. F. R. Talley, Petersburg. I want to say how glad I am that a plea for the standardization of root-canal work has been made. It has been my feeling for some time that this operation should be standardized, and if I had written a paper at all for the association, that would have been my theme. My attention was first seriously directed to canal work by Dr. Grieves some years ago at Old Point Comfort. Later, Dr. Callahan's method seemed to assure us of success in this matter, but at about the time we settled into the feeling that we were certain we were right, the radiograph began to make us sure that we were wrong. There is such a diversity of opinion among the best men of the country about this matter that some plain dentists like myself hardly know what to do. Dr. Grove recently made an experiment on one hundred teeth, as the result of which he concluded that there were more teeth which were filled to the apex that had foci of infection than teeth not so filled. He attributed this to the drugs used in the treatment of these teeth, and the various pastes used in filling canals. In the January number of the *Journal of the National Dental Association* Dr. Hinman had an article advocating the use of sulfuric acid, formocresol, and gutta-percha, the first two being condemned by Dr. Grove. He also gave an aseptic surgical method of applying the rubber dam. Now Dr. Prinz thinks that ionization is necessary. Dr. Buckley does not agree with him, and thinks that the use of phenol-sulfonic acid works very successfully; he does not believe that ionization is necessary, while Dr. Prinz and others believe it to be a very essential part of the treatment. Regardless of these differences of opinion we almost all agree that the X-ray is necessary in many cases. So I have about come to the conclusion that we do not know much about root-canal filling, after all. In fact, I am almost hysterical about it. Every time I do it, I expect the patient to develop some focus of infection before the next day. If we can get a standardization of root-canal work, something that a man practicing under difficult circumstances, such as men in small towns and rural districts, can do successfully where they have no electricity to furnish either the X-ray or ionization, I think it will be one of the most important advances that can be made. Let us get together and take the *best* of all methods. Let us have a conference of root-canal men, if necessary, and set up a standard whereby the majority of good results is obtainable. I must admit that I am not at all satisfied that the radiograph shows us that the work itself is rightly or wrongly done. The tooth may be filled properly and to the apex, and there may be some bacteria brought to a point of lowered resistance through some infection of the peridental or periapical membrane; or the infection may be brought by the blood stream and deposited there, and set up the trouble. The more I see of radiographs the more I am convinced that we are not positive regarding root-canal work. We are certain that it causes a lot of trouble, and we are not certain about anything else. I hope that standardization can be evolved in some way; it would relieve my own mind to a great extent. I try to do the work carefully, yet am doubtful of results. Some who are specializing in canal work aided by the X-ray get, I am told, from fifty to a hundred and fifty dollars a tooth. What man of you can demand such prices for this service? We must do this work conscientiously; we cannot do it without spending two hours, and sometimes three or four hours, on a tooth, and then it is doubtful whether enough time has been spent. The point I wish to make is this: First, we should not appal the average man engaged in general practice by insisting upon such a complicated technique augmented by such an array of appliances, often absolutely impossible for him to operate because of lack of facilities, and thus discourage him in making his best efforts in this direction. Second, if we do this work at all we should do it as nearly right as we can, whether we are paid for it or not. Third, there should be a second-best standard of technique and materials to fill the needs of those who cannot avail themselves of the first standard, thus encouraging better root-canal work all along the line.

Therefore I think this association would do well to have a committee appointed whose special work would be to consider the various methods now advocated, pick out the best elements of each, and bring them before us for discussion.

Dr. L. M. Cowardin, Hot Springs, Va. I do not consider myself capable of using the X-ray machine; and I am not satisfied about the diagnoses which have been spoken of tonight. If you consider practical experience and practical results of value, I can say that not half of 1 per cent. of the teeth that I treat abscess. I should like to know whether the light areas shown in those positive plates are not simply signs of lowered resistance, and not indications of the presence of pus in these cases. I have always been taught that wherever pus was to be found it would make its way to the surface, with swelling and pain, if it were an infected abscess; or, in the case of a cold abscess, there would be a necrotic process, gradually destroying the tissues, and eventually opening on the surface. I have seen abscesses in the mouth that made their way to the surface and discharged, and yet the patients said they never had any pain or inconvenience. I can truthfully state that within the last twenty-five years—and I see my patients from year to year—none of the patients that I have treated have come back to me with sinuses, and they have not had rheumatism. Some of these teeth were treated thirty-five years ago. Every tooth we fill is liable to give trouble, because so many roots have abnormal formations in the way of crooked roots and funnel-shaped openings at the apices. I am not prepared to say anything about the roentgen ray, but wish to say to Dr. Hunter that I consider the burden of prevention to lie more on the medical man than on the dentist. We have not the *entrée* to the homes of patients that physicians have. It is true that we do see their mouths, but we have not control of their stomachs, nor have we the definite care of patients that would enable us to dictate what their children shall eat.

I try to teach mothers how to feed their children so that they do not suffer from dental diseases. I have in mind particularly the son of a medical man in Hot Springs, who has been to see me two or three times within the past year. Neither the mother nor the father has a good constitution, but the boy is one of the most vigorous and healthy children I have ever seen at the age of seven years. I put a little amalgam filling on the grinding surface of one of his deciduous molars. It was not necessary. I merely did it to gratify the child, because he wanted to have a filling, and it did no harm. Outside of that, he has not had a break in any of his teeth. He is just beginning to lose his deciduous teeth. Abscesses will not be so frequent if the child is taught to eat with a proper regard for the condition of his stomach. The medical profession should see to that. Children should not be allowed to eat between meals. What is in the stomach does not directly affect the teeth, but the mouth is never clean when people are eating constantly.

Dr. C. E. Harper, Danville, Va. This discussion is very comforting to a good many of us here. If the gentleman who preceded me has been practicing forty-odd years and has obtained the results he has, we ought not to feel so badly about the conditions thrown on the screen. Of course, we ought to continue to do scientific work on the subject, but if we take too much to heart what we see in the radiogaphs we are apt to feel like quitting dentistry, or else extracting everybody's teeth. I saw a lady shortly before I came away who had just been treated for indigestion. She had been put to bed and given the rest cure, which is very popular just now, and fed entirely on soft food. I found that she was just developing pyorrhea. Her teeth had a slimy coating over them, although she claimed to have brushed them regularly, and I believe she did. Her gums were beginning to become swollen and spongy. I treated her teeth, removed what tartar I could find, and told her to go home and, regardless of what the physician had said, get some stale hard biscuits and chew them, whether she swallowed them or not. I told her that her teeth needed exercise, just as did any other part of her body. Within a few days her gums had resumed their normal condition. She asked me about chewing-gum instead of crackers, and I told her it would not be so good. I never saw a case clear up better than that one did. I believe much trouble is caused today by the use of predigested foods, and the lack of use of the teeth. Their improper use is also a source of trouble. A dentist can tell on which side the patient chews. You will find that the teeth on the side on which they chew have very little tartar on them, while on the other side the gums are spongy and there is a good deal of tartar and decay. I believe the proper feeding of infants and young people is of the greatest importance in the care of the teeth.

Dr. W. H. Street, Richmond, Va. I am very much interested in the subject; and for my own satisfaction and that of a great many gentlemen here, I should like to ask Dr. Crane to answer one or two questions when he closes the discussion.

In the first place, I should like to know at what time in the life of a tooth, after the tooth is devitalized and filled, the final pathological change, if any, occurs. I have been doing for some time a good deal of X-ray work, and most of the bad results from infection that I have found have been from teeth that have been filled for a period of years. Of course the condition grows worse the longer it remains, but I have the idea that although a tooth does not give any trouble, if there is some infection carried into the root-canal, the results will probably show in a picture within six months after the tooth is filled, and certainly within a year or, at the outside, two years. A great many times we find in the same mouth, in teeth treated equally well, and side by side, or in two roots of a molar, good results and bad results respectively.

As to drawing the line between teeth that must be extracted and teeth that can probably be saved, the plan I follow is this: One never knows from an X-ray picture just exactly under what circumstances a tooth has been filled. Therefore, if I find a very slightly diseased condition at the end of a root that has not been opened up, and there is a devitalized pulp in the tooth, I know that the tooth has not had a chance. If I find a poor root-canal filling, the probability is that if the tooth is opened up, treated carefully, and filled properly, the condition will clear up. On the other hand, if I take a picture and find that the root-canal has been properly filled as nearly to the end as we think is possible, I conclude that it is a tooth that has probably had the best of treatment. Therefore I judge the tooth has had an opportunity to take care of itself, and has failed to do so.

There is one other point I wish to speak of. With all due respect to our friend, Dr. Cowardin, when he says that not half of 1 per cent. of the teeth he has filled have ever abscessed, I believe that this is something that we cannot possibly be sure of without having had X-ray pictures taken of a great number of cases in which we have operated. I have found that we cannot rely on the fact that a tooth has never given any trouble as evidence that there is no infection at the end of the root. I have had dozens of cases in which, when I said to patients, "This tooth is bad and must come out," they have laughed at me, and said, "Why, I have never had the slightest feeling of uneasiness in that tooth." I have had to take the picture and show it to them in the best light, in order to convince them of the condition of the tooth. One of the worst diseased teeth I have ever seen I extracted last week from the mouth of an old lady of eighty years. It was a horrible tooth, one that I believe if it were in my mouth would make me an invalid within two months, and yet she had not had the slightest indication of its condition. She had never felt any pain in it. Therefore I believe it is impossible to say when a tooth is free from infection. If one has a healthy body and can stand the presence of the pus in the system, he is lucky, but sooner or later the condition will show.

Another point. Dr. Cowardin referred to the rarefied areas around the roots, and inquired if these were genuine foci of infection. Last week I took a picture which showed that the patient was in a very serious condition, and the physician wanted every foci of infection in her mouth eliminated. The radiograph showed one molar with a very slight area of infection. I extracted this tooth and with the curet I found a cavity in which there was an enormous quantity of soft, mushy necrosed bone.

One of the most important things that we have to do is to eliminate this question of root-canal work. I should like to eliminate it from my practice by training my patients never to go over a period of six months without coming to me. If you get the parents of young children to put them in your care, you may order them to your office when you want them, and if they are stimulated to take an interest in the care of their mouths, they will come. Proper food supply and mouth hygiene at home are all right, but it is necessary for them to come to the office at reasonable intervals, and have their mouths examined. Usually there are three things that will drive patients to the dentist's office: One of these is pain—and when there is pain there is trouble. Another thing is a cavity large enough for the patient to see or feel with the tongue, and then also there is trouble. Have the patients come, and fill the small cavities before the pulps or the roots of the teeth become involved.

Dr. Crane (closing the discussion). It has been a great pleasure to me to be present tonight, and to be able to present to you this paper—which I feel is very incomplete. I think that when it is published, if you will take the trouble to read it carefully, you will see that I have tried to avoid making any dogmatic statements. What I have said is founded upon years of as grueling disappointment in root-canal work as any of you have experienced.

The gentleman who said he was afraid to fill a root-canal, and did not sleep well the night after doing it has my sympathy, but I feel that I have passed that stage now by the aid of the technique I have laid before you, and especially by taking the proper precautions to be sure that infection has been eliminated. You can be sure, when pain follows the filling of a root-canal, that, in the great majority of cases, it is not caused by your filling or lack of filling, but by infection still in the tissue.

Dr. Hunter showed us some very interesting slides on the screen, and followed up as lucidly and convincingly as could be the statement in my paper that, in the absence of good clinical data, a diagnosis cannot be made from radiographs. We all have seen radiographs made by specialists in roentgenology, with an area marked "abscess." How does the X-ray man know this? On the screen I showed you a typical area such as is often caused by an abscess, over a tooth that had a vital pulp. The cause was a crown which had been put on in such a way as to produce traumatic occlusion. You cannot say that these radiolucent areas are the result of infection unless you can check your statement by clinical data.

Dr. Talley mentioned the paper by Dr. Grove reporting his investigation of one hundred teeth, in which he found a larger proportion of rarefied areas in those with filled root-canals than in those in which the canals were only partially filled. I could not begin to discuss that paper as well as Dr. Ottolengui did in his editorial comment in *Items of Interest,* but I will say, in the absence of any history as to who treated these teeth, as to how they were treated, or as to their condition before they were treated, that the study of such a series of cases is almost worthless from a scientific standpoint.

Dr. Talley also spoke of the lack of electricity in the country districts. That is a serious hindrance to radiography, and I do not believe correct root-canal work can often be done without the use of the radiograph. That places you gentlemen who are working in country districts in a difficult position in treating patients who cannot afford to go to the city and have X-rays made, but equipment is available to all for ionization and bacteriological examinations, so that there is no excuse for filling an infected canal.

Dr. Cowardin took exception to radiographic evidence of abscess, and said that he did not believe these radiolucent areas contained pus. In a very large majority of cases he is absolutely correct, but pus is not the *cause* of the trouble, rather is it an *expression* of the trouble. When we have an infection by pus-producing organisms, we have a battle being waged between the white blood cells and the bacteria, and from that battle-line the dead and dying are thrown off in the form of pus. It is nature's method of producing an autogenous vaccine. When we cut down on these areas, however, we do find softened bone, granulation tissue that is soft and not organized, and various other signs which are typical of infection.

Dr. Harper and another gentleman brought up the question of what we shall do when the patients cannot pay a fee sufficient to compensate us for the time we have to spend in this work. Are we justified as practitioners of the healing art, whether for fee or lack of fee, for time or lack of time, in so treating or failing to treat the teeth of our patients that we leave in their jaws an area of infection which our friends of the medical profession tell us may cause not only rheumatism, but diseases of the heart and kidneys, and the ultimate death of the patient? If you accept a patient, and then, because he cannot afford to pay for the time you must expend, cause a focus of infection to persist in his mouth, and later he is taken with endocarditis and his physician says that this tooth is the cause of it, and the patient dies, how will you square this matter with your conscience? The whole problem is so serious that we are no more justified in intentionally leaving these infected areas in our patients' mouths as the result of our treatment than we would be in taking a hypodermic syringe full of micro-organisms and injecting it into the patient's blood stream. If we do it, we are responsible for everything that follows. We are not wholly responsible for the mistakes of the past. The physicians are equally responsible with us, because they have been empirically treating these systemic diseases for years, and it is only recently that they have come to recognize the theory of focal infection. The dental profession has not been slow in attempting to so improve its technique that in the future these cases will not occur. For the mistakes of the past the only thing we can do is to treat the teeth which can be sterilized and extract those which cannot. If the patients cannot afford to pay for treatment, then they have to take what they can afford, extraction, or you must give them other treatment for nothing. Go home and extract these teeth, if the patients will not have them filled. Let them go without any teeth rather than give them the impression that you have treated and eliminated the disease, when you know that you have not.

Dr. Street wanted to know at what time the result of infection would show in the radiograph. I should say, anywhere from twenty-four hours on, depending upon the virulence of the infection and the resistance of the tissue. Infection is shown by disintegration of the bone cell, in which the lime salts disappear and the spot becomes radiolucent to the X-ray. That process, as in necrosis of any other bone, can take place in twenty-four hours or any time thereafter.

He also asked how to determine which teeth will respond to treatment and which will not. I tried to show in my paper that, especially so far as the radiograph is concerned, this can generally be determined by the condition of the root apex. The size and density of the bone area has very much less to do with the prognosis than the condition of the apex, for if the apical fibers are destroyed, the cementum is dead tissue. You can heal disease, but you cannot raise the dead.

Something has been said here tonight in favor of the clinical evidence of the elimination of infection. If Dr. Cowardin will take a few clinically "cured" cases where radiographs show the radiolucent areas about the roots usually termed abscesses, cut down on them, and expose them in a bloodless field, he will not need any other evidence than the gross appearance of the tissues to show that there is infection.

I thank you all for your kind attention to my long paper. The point I have tried to bring out is this: When someone, or some body of men, does for root-canal technique what Black has done for operative dentistry, what Angle has done for orthodontia, and what Greene has done for plate work, and Chayes for removable bridge work, then the main difficulties of root-canal work will fade away.

The meeting then adjourned until Wednesday morning.

(To be continued.)

Northeastern Dental Association.

Twenty-second Annual Convention, at Hartford, Conn., October 11, 12, and 13, 1916.

(Continued from page 740.)

THURSDAY—*Evening Session.*

The meeting was called to order at 8.30 P.M. by the president, Dr. Cary.

Dr. W. S. PAYSON, Castine, Me., read a paper entitled "Anchorage of Alloy Fillings in Badly Decayed Teeth, and the Use of the Matrix."

[This paper is printed in full at page 803 of the present issue of the COSMOS.]

DISCUSSION.

Dr. Geo. A. Maxfield, Holyoke, Mass. It is very much to Dr. Payson's credit that twenty-eight years ago he commenced this method of securing large fillings in badly decayed and broken-down teeth, which at that time ninety-five per cent. of the dental profession were yielding up to forceps. Probably not more than four or five in this room remember much about the amalgam war that was raging in its intensity only twelve years before Dr. Payson took up this method. He had been a student of Dr. Flagg of Philadelphia, and had evidently absorbed from him much of his enthusiasm, which more than overflowed whenever he discussed the amalgam question. Dr. Flagg was one of the pioneers in amalgam work, and one of the leaders in that war, and the maxim they adopted was, "As a tooth needs saving, gold is the poorest material to use." Perhaps if they had put it a little differently, "As a tooth needs saving, amalgam is the best material to use," there might not have been so much antagonism—for it was like waving a red rag before a bull to even mention to the believers in gold filling that anything could be better than gold. Time, however, has proved that these pioneers were correct, and teeth were and are being saved with amalgam that could not have been saved with any other material.

Dr. Black has done, I think, more than anyone else to enlighten us on the amalgam question. His original research work showed what metals were needed, and their proportions in an alloy to make a good amalgam filling. Dr. Black also demonstrated how we could temper an alloy in fifteen minutes. This was formerly called aging, and up to that time it took from six months to a year to properly age the alloy.

Some thirty years ago I commenced making my own alloys, and have continued doing so since, so of course was much interested in all of Dr. Black's experiments. The expansion and shrinkage of amalgams, also the flow of amalgams under stress, he demonstrated by special apparatus which he invented, and by numerous experiments he found that an alloy composed of about sixty-two parts silver, thirty-three parts tin, and five parts copper, stood up the best under all his tests.

In Dr. Flagg's book, "Plastics and Plastic Fillings," he gave us the formula of an alloy which he called "submarine" as the best for general use. This consisted of sixty parts silver, thirty-five parts tin, and five parts copper, showing that there was but little difference in his and Dr. Black's conclusions as to the metals and proportions to be used in alloys.

I formerly used the pins mentioned by the essayist for the retention of fillings, but of late years I have found less need for them. I have always contended that the less metal you place in the cavity of a tooth the better it will be for the tooth, and for that reason I like to use as much cement as I can under the metal in all the cavities I have to fill. Metal fillings do not adhere to the walls of the tooth cavity, while cement does, and thus strengthens the tooth. In deep cavities, if the pulp is vital, a thin covering of cement will not answer, as the irritations of heat or cold will be conveyed through the metal and cement; so in such cavities I find a filling consisting of two-thirds cement and one-third metal is the most satisfactory. If I am using amalgam in these cavities, I burnish it into the cement while the latter is still soft. By this method one has the advantage of the adhesive quality of the cement with the amalgam embedded in it, and we can easily build out half the tooth and have it remain firm. These fillings must not be disturbed until crystallization is complete, and therefore the filling must be protected from any stress that may come upon it. I have put in a great many amalgam fillings in this way where there was only one wall of the tooth cavity left. In these cases I make a very thin band of copper, contouring it to the tooth as closely as I can, and before placing the band on the tooth fill most of the cavity with cement; while the cement is soft I begin burnishing-in the amalgam, being careful that the amalgam covers all the edges so that no cement is exposed; then I place the band on the tooth, and fill the remainder of the cavity solidly with the amalgam. I remove as much mercury as possible from the filling by the use of tin foil, and then dismiss the patient. The next day I cut off the band and thoroughly polish the filling, and then have a filling that stays. Two weeks ago I saw one that I put in in this way over seven years ago. In large contour fillings, if you do not use a band, you must be very particular about the articulation, for a little stress may be brought upon the filling when closing the mouth, and weaken a portion of it. This little break in the amalgam may not be noticed at first, but in the course of a few hours, after the patient has gone, a piece of the filling will drop off. It is for this reason that in building out these large contours I like to leave the band on the tooth for at least twenty-four hours.

In regard to the technique of Dr. Payson, he has made it very clear, and I do not think anyone could improve upon it.

Dr. C. Frank Bliven, Worcester. I did not hear the paper, but I infer that the essayist depends upon pins inserted in teeth for the support of fillings. A pin is a good attachment, but I do not think it can always be depended upon. It is entirely a matter of judgment, and we must deal with each case according to our best understanding. The man whose mind leads him to use pins may get better results with them than he would with cement; another man who is familiar with the use of cement may get better results from its use than he could with pins. I have been making restorations for twenty-five years or more, and having used both methods I can advocate both. The pin frequently adds sufficient support to take care of a heavy overhanging contour, whereas cement might not be satisfactory. In other instances cement would be preferred.

The support given by the pin depends on the strength of the tooth and the attachment of the pin to it. Cement may be attached to a cavity in a tooth so firmly that it will strengthen it, and can be removed only by grinding it out. The combination of cement with other filling material will add greatly to its strength.

Dr. Payson (closing the discussion). The use of the pin as I have described it is a mathematical certainty. Perhaps if I could employ cement as well as Dr. Bliven does, I might give up the use of the pin. If we put in a thin lining of cement and burnish the amalgam over it we do not know whether the amalgam goes close enough to the pulp to cause changes in it. If we put the cement in in two lots, as I understood Dr. Maxfield to say he does, there is no objection, but the pin affords an absolute mechanical anchorage. I tried to make it clear in my paper that I line all cavities that I possibly can with cement.

The next item on the program was the reading of a paper entitled "Mistakes Made in Root-canal Work," by Dr. WM. A. SPRING, New York, N. Y.

[This paper is printed in full at page 795 of the present issue of the COSMOS.]

DISCUSSION.

Dr. Thomas J. Barrett, Worcester, Mass. The subject of treating and filling root-canals has long been before the dental profession, and the various methods presented to us from time to time show how we differ in our ideas, and how we advance as time goes on. The method offered by the essayist appears most practical. There are many things about it that every man in the room probably does, although perhaps in a different way. Very few use exactly the same procedure. My treatment varies quite a little from that of Dr. Spring.

On the question of the proper filling material, I think the profession as a whole now approves of gutta-percha as a root-filling. There are various methods of inserting it, but all are now agreed that it is the most practical material to use.

The essayist employs a fine solution of gutta-percha. He makes it in a bottle, and then inserts it in the tooth. I make the solution in the tooth itself. I use little droppers to reach the root-canals, put the chloroform into the canals, insert the gutta-percha points, and dissolve them there. That has been the most satisfactory method for me.

Dr. Spring says that it is a mistake to do any root-canal work without using the rubber dam. I presume that he means the treatment of the canals previous to filling. I never use the rubber dam until I am ready to fill the tooth. I carry the treatment on without it, but when I am ready to fill the canal adjust the rubber dam. He says that since he has been using the rubber dam he has had no trouble. I do not know that I quite understand him, unless it is that he has abandoned the custom of leaving putrescent root-canals open. If the root-canal is one that contains a putrescent pulp, I do not believe that you should seal it. When you use formocresol, it is advocated that you seal it, but I do not use that, and I always leave such roots open.

I agree with the essayist in regard to reaming. In the hands of the most skilful it is apt to cause trouble, and in the hands of the careless it is liable to have very bad results.

In regard to the question of immediate root-filling, while this has its supporters, I think that it is wiser to leave the root open for twenty-four hours before sealing it, after the use of pressure anesthesia. Of course, no one would apply pressure in a case where there is any putrescent material in the cavity. Dr. Spring uses dioxid, as you and I do. Its use, however, has been both approved and disapproved. It was once considered to have wonderful curative qualities. It was claimed by some that infection could be forced through the apical foramen by the gas formed, but it is now known that the gas pressure is no greater at one point than at another, and that it will finally escape in the direction of least resistance. It has not been my experience that infection could be forced through the apical end, and I feel that the use of dioxid has done more good than harm in my hands.

Formocresol, the essayist says, he does not like. I used it once, but would not do so again. I do not think that we should ever use in a tooth a medicine that requires a strong neutralizing agent to overcome its destructive action. I believe we can treat diseased teeth without the use of these powerful drugs.

Asepsis in the preparation of root-canals for filling I must heartily commend. Asepsis is not practiced as it should be. In our desire to attend to as many patients as possible, we often fail to recognize the absolute need for as near an approach to surgical asepsis as can be secured. Of course, complete surgical asepsis is almost impossible in a dental office, but asepsis as outlined by Dr. Spring is something that we can obtain, and should try to practice as nearly as possible. There, I believe, is where more harm is done than by the failure to reach the exact apex of the root in our root-canal fillings. We have had so much said to us of late about our failure to recognize what the radiographs are regarded as showing—diseased areas—that almost all diseases of mankind are now being charged to mouth and teeth conditions. When the patients' troubles cannot be diagnosed, they are referred to a dentist. Some years ago one would have been regarded as a quack if he had said that mouth conditions were responsible for systemic diseases, but this has been found to be the case as the result of X-ray work. It is a subject for future discussion. I myself am not prepared to accept the responsibility for the various ailments that are now being charged to faulty dentistry, particularly along the line of root-canal fillings. To fill a root-canal properly is one of the most exacting and painstaking duties we have to perform. Some men in the profession may not carry out this work as carefully as they should, and bad results may follow, but many have made rapid progress along that line and do very satisfactory work.

Dr. N. S. Jenkins, New Haven, Conn. The aseptic precautions that the author of this interesting paper insists upon are as valuable as the X-ray itself, and no one in our day is justified in neglecting them. The method of securing such asepsis, and indeed, the whole technique that Dr. Spring describes, especially his reliance on frequent radiography, are beyond criticism. The use of gutta-percha as a filling for root-canals I do not consider to be completely satisfactory. The chief objections to it, as Manning has pointed out, in his article in the DENTAL COSMOS for July 1916, on the "Practical Usefulness of Gutta-percha," are, first, incompatibility with water, second, capillary repulsion, and third, ready absorption of gases. Probably Dr. Spring will agree with me that in our experience in European practice we have never found it safe to immediately place a crown on any root that had long been filled with gutta-percha. Such roots need disinfection, and require renewed filling to the apex before crowning. It is also an objection that in the modern system of filling roots with gutta-percha a portion of the filling is often carried through the apical foramen. Although this may not immediately produce untoward results, it constitutes an abnormal condition, and we must expect the ingenuity of those who have carried us so far on the road to perfect treatment of root-canals to give us, in good time, a more desirable material for this purpose. Knowing what I do of the admirable results that Dr. Spring obtained in root-canal work before the discovery of the X-ray and before the danger of incomplete asepsis was fully recognized, I submit that his paper should be called "Success in Root-canal Work."

Dr. Frank J. Erbe, Waterbury, Conn. It amused me to hear Dr. Spring say that this last year was the hardest year in his practice of dentistry. I can agree with him heartily from my own experience. In treating the upper third molar of a brother of mine, I spent ten hours in clearing out three canals and filling them; and in other cases I have consumed a similar amount of time. I will say, however, that if one works hard enough, he can accomplish the desired end.

One point that I made a note of was the difficulty of gaining entrance to the canals. I have found that in reaming before probing one is liable to clog the canals, but by putting in a drop of sulfuric acid, 30 per cent., and neutralizing it at once with sodium bicarbonate, the organic matter is boiled out and overcomes this difficulty. In removing broken broaches left by others as well as myself, I have often boiled them out very easily in this way.

There is one thing that I have learned from experience that may be a great help in making a diagnosis before you wish to take a second X-ray picture. I used to be misled by accepting the feelings of the patient as evidence that I had come to the end of the canal. The patient would wince, and I would proceed to fill the canal, thinking I had reached the end. But after taking a radiograph I would find that I had not reached the end of the canal at all. I then discovered that when my wire actually passed the end of the canal there was little sensation, so that I could be sure that when the symptom of pain was present, I had not yet reached the end of the root.

I should like to know to what extent Dr. Spring carries ionization and in what cases it is necessary to ionize. He did not speak of using the solution of resin. I use it as recommended by Dr. Callahan. I clean out the organic matter from the dental tubuli with sulfuric acid and sodium bicarbonate, and then, after thoroughly drying, I seal the dental tubuli with the resin solution. The canals are filled at once. Of course it takes time before we can get the canal cleaned out thoroughly. When I have removed all the débris and satisfied myself that I have reached the end of the canal, I fill immediately. I have never had to remove any of these fillings because of trouble afterward.

One thing that has helped me is the obtaining of a proper set of rubber dam clamps. I apply the clamp first, then slip the rubber dam over it. It used to be very hard for me to apply the rubber dam, but now it is a very simple operation.

Dr. J. W. Harper, Hartford, Conn. I do not want to put a fly in the ointment, but I wish to tell you something that may be interesting. I indorse what has been said. I believe in the modern methods of filling roots. At the same time, I filled many years ago the root-canal of one of my own lower molars with cotton and creasote. I had an X-ray taken of it recently and it was found to be in good condition.

Dr. Ned A. Stanley, New Bedford, Mass. The radiograph has exhibited a picture that we do not like to see. It has shown how far short almost all of us are of doing perfect root-canal work. I like to employ the rubber dam where I can, but in some cases it is impossible, and one has to use the clamp and pack cotton rolls around the tooth, using the saliva ejector to keep the field clear. If the pulp has been putrescent I seldom seal the root immediately after the first treatment, but before the root is filled I like to seal it up and give it a trial before I put in the root-canal filling. Tricresol and formaldehyd makes an excellent dressing. Dry sterilized canal points inserted in the root and then touched with a pledget of cotton saturated with this agent is a very good way to apply a dressing. Finding the root-canals is often difficult, and a solution of sulfuric acid is frequently beneficial in helping us to open them up properly. I use gutta-percha almost altogether in filling root-canals, and employ the means that Dr. Barrett has described, putting the chloroform in first, then a small gutta-percha root-canal point, and follow this with other points. The gutta-percha soon becomes liquid, and you secure a good root-canal filling.

Dr. C. W. Roberts, Hartford, Conn. I should like to add my testimony to that of those who have benefited by this excellent paper. I find I am not the only man who is a long time in finding the apex of a root-canal and being sure that the work is perfect. There is one subject that the essayist has touched on but has not clarified, and that is the use of hydrogen dioxid in root-canals. I understood Dr. Spring to state that he uses it after pressure anesthesia. These operations, in my experience, almost always result in more or less hemorrhage of the pulp, and I understand that he uses the hydrogen dioxid in these canals in the presence of the blood. I had been very fond of seeing the bubbling effervescence produced by hydrogen dioxid in these cases, and used to think that it was a harmless drug, but I once unfortunately used it in an anterior tooth after pressure anesthesia for the purpose of checking the hemorrhage. The result was one of the most vicious discolorations of the enamel of the tooth I have ever seen. I afterward found advanced in Johnson's "Operative Dentistry" the theory that hydrogen dioxid is a solvent of the coloring matter of the blood, and carries into the dental tubules this coloring matter, the result being a discoloration of the dentin and enamel.

Dr. J. K. Burgess, New York City. The radiograph has shown many surprises. I think Dr. Spring deserves great credit for coming here and giving us the results of his experience as a novice in X-ray work. If we would record our failures as well as our successes it would be invaluable to the dental profession. I never complain of an accident if by studying its cause I can eliminate any subsequent occurrences of a similar nature from my practice. I can frequently notice the swinging of the pendulum with regard to dental operations. Many of us were formerly careless or incompetent in our root-canal work, but now the pendulum has swung the other way and we are becoming extremely radical. I hope that later we shall reach a middle and saner ground.

But I did not get up so much to commend Dr. Spring's paper as to say "Amen" to what Dr. Jenkins has said. Gutta-percha should not be forced through the root-canal. It has no business there. The danger is too great, even though in some cases it does no harm. It is not a perfect root-canal filling, although it may be the best that we have at this time, and I am not even sure of that. I have filled more canals with it than with any other material, but have never been satisfied. But whatever the virtues of gutta-percha, I am convinced that chloro-percha is a very poor material for the purpose. We cannot use it without carrying some of it beyond the apex of the root, especially where there is an open space beyond the root. My experience with it has been short. I never attempted to use it until I began radiographic work, which was very recently, but I have found that the pressure of the gutta-percha on the chloro-percha, when placed in the root-canal, will almost inevitably force the chloro-percha beyond the apex of the root, and I believe this to be bad practice. I have nothing to offer as a substitute for gutta-percha, but I believe that it is not the ideal root-canal filling, and that something with fewer faults and greater virtues will be discovered to replace it.

Dr. Jenkins. I should like to say that while I by no means know of a method of filling root-canals which is adaptable to every possible condition, I do know of a method which under ordinary circumstances is preferable to filling with gutta-percha. There are cases in which it is found necessary to remove the filling of the root, and if one is practicing dentistry upon the principle that such a procedure may be necessary, then the method that I suggest is undesirable. But where a healthy pulp has been removed entirely to the apex of the root under satisfactory asepsis, or where an infected root has been restored to normal condition through treatment, the root can usually be filled with zinc oxychlorid exactly to its very point, to the complete exclusion of microbic invasion. This occurs partially through the therapeutic value of oxyphosphate, but still more through its close adherence to the dentin. It also seemingly penetrates into the dehydrated tubules to a slight degree. Certainly, it becomes practically impermeable.

By this means one excludes the possibility of internal infection and preserves the color both of the root and of the crown of the tooth—supposing it still to possess a crown. Moreover—and it was this to which I was referring in my remarks relative to Dr. Spring's paper—in all cases in which a root has been filled in this manner and afterward the frail crown is broken off, one can immediately set a crown upon that root without danger of infection, if the filling is not removed to the end of the root.

During the last thirty-five years of my practice I employed this method exclusively, except in some instances where the general condition of the patient made exact treatment impracticable, and found only two objections to its use. One was the difficulty of carrying the oxychlorid exactly to the end of the root in abnormally fine or devious canals, and the other was the danger of pumping a minute quantity of the cement through the foramen, and thus causing the patient pain which might endure for hours.

I should suppose both of these objections were now obviated through Rhein's methods of enlarging the root-canals, and showing by radiographs every step of the process until the foramen is reached. But it may be that the genius which has devised these admirable methods will yet provide us with a material for root-filling to which no objection whatever can be raised.

Dr. John W. Harper, Hartford. I rise to a point of information. From what I have gleaned here tonight, if I have not misunderstood the paper, it would appear that things may be forced through the foramen at the end of the root. I do not care whether it is gutta-percha or zinc oxychlorid or anything else, it is a bad practice to force anything through the foramen. Let us assume that there is a normal root with everything functionating around the tooth in a healthy manner. We are told that gutta-percha is not irritating, and that a little zinc oxychlorid produces no bad results. But I am speaking of the normal relations of the fluids and tissues, and I would ask the question: Is it possible to force anything through the foramen at the apex of the root of a tooth and have that tooth still in a healthy and normal condition? I do not believe it is. There is a disturbance of function in some way. It is contrary to nature, in my opinion. I may be mistaken, of course.

Dr. Geo. A. Maxfield, Holyoke, Mass. I have been treating and filling root-canals for more than thirty-five years. My first effort was in the case of an upper left central incisor. The patient had met with an accident in an explosion which broke off this central about one-half its length, and when he came to my office the pulp was exposed. I managed to get the pulp out and filled the canal with gold. Three days afterward he came in with his face badly swollen—evidently an alveolar abscess. I did not know what to do, for we had heard very little about treating alveolar abscesses in college. Two days later, when he came in again, the swelling had gone, and he handed to me a little piece of gold which he said he had picked out of his nose. Evidently I had filled that canal to the end, and a little beyond.

Now, gentlemen, what are we getting from all these papers and discussions on treating and filling root-canals? What are we getting for the benefit of our patients? How many of us can labor for from ten to twenty-five hours in opening up the root-canals of a tooth and taking several radiographs during the operation? and how can the average person afford such work as this? Are the people going to be deprived of the benefits of dentistry? Last May Dr. Hartzell read a paper in Boston on this subject, and the next morning I had a long talk with him on the same topic. I told him his paper had given me the blues, and he replied, "You must remember there are two sides to the question." So I went home and thought the matter over. I went over in my mind the cases of all the patients that I could remember for whom I had treated and filled root-canals, and found that I did not know of one who had rheumatism, heart trouble, ulcer of the stomach, or any of the other troubles that we hear are coming from imperfect filling of root-canals.

I do not believe it is necessary to have an X-ray apparatus in every dental office; not that I do not appreciate the value of a radiograph showing a crooked root, and to show whether or not the filling has gone to the end of the canal, but it is a luxury and not a necessity. I believe it is necessary to make the cavity and canals as antiseptically clean as possible, but I never put the rubber dam on when I am treating or filling a root-canal. The first thing I do is to flood the cavity with a strong antiseptic, and for this purpose I use a saturated solution of hydronaphthol. After cleaning out the cavity and pulp chamber I open up the canals. I think I am right in saying that not one operator in a hundred can clean out all the small fine canals with broaches, especially if the pulp is putrescent, dam or no dam. I use the Gates-Glidden drills for opening all canals, constantly washing out the cavity and canals as I proceed. Any canal, I do not care how fine, that can be entered with the finest point of a broach can be opened up with these drills, employing sulfuric acid as advocated by Dr. Callahan. Cotton will not do; the acid will dissolve cotton, but not wool. After working the acid up into the canal, fill the canal with a solution of sodium bicarbonate, working in this way until near the end of the canal, then use hydrochloric acid. It works more slowly but it is safer; sulfuric acid is a violent caustic, and if the least amount gets through the apex the soft tissue there will be destroyed.

For filling canals I do not think there is any material so good as gutta-percha. After opening the canals with drills, the points are rolled out to just the size of the drill, the canals dried out, a solution of iodoform in eucalyptol pumped into the canal, and the point forced up to the end. In this way I believe we have a more perfect filling than by any other method.

Now, ladies and gentlemen, we must serve the public. Teeth must be saved, and how shall we do it? We cannot spend all these hours that only rich patients can afford to pay for on one tooth. By thorough, honest, and conscientious work we can save the teeth as we have been saving them for the past thirty years or more. Of course there will be some failures. We have not reached perfection, but when our treatment and filling of root-canals have saved teeth for thirty years, we have a right to claim that our methods are a success.

Where are we drifting to if we adopt all these machine methods? What is to become of our skill in diagnosis that we have been endeavoring to develop since the beginning of dentistry? It is said that the X-ray is an aid to diagnosis. Yes, it may be, but one must not put so much reliance upon it, for often we are sadly deceived. All we hear today is *infection.* No matter what the trouble is, we are told that there is a source of infection somewhere, and more than likely in the teeth. Only last week a patient was sent to me who had been suffering from neuritis. As the neuritis did not respond to treatment a radiograph had been taken, as the physician thought there might be an infection from an abscess on a tooth on which there was a gold crown. By questioning the patient I found that the pulp was vital when the crown was placed on the tooth, but irritation commenced soon afterward, and finally developed into neuritis. In this case there was no infection, the neuritis being due to reflex action on the nerves from the irritated pulp. When the pulp died the neuritis ceased.

I want to cite one more case that occurred in my practice several years ago. The patient was my own sister. She came in one day having a little irritation from a tooth. I found a fair-sized cavity. I put in a temporary gutta-percha filling and as the tooth was comfortable she did not come back at the date I gave her. Several months later, after being out in one of those cold rainy days in November, she awoke the next morning with severe neuritis in the right shoulder, which soon went down into her hand and fingers. After several weeks' suffering, and with no relief from the treatment given, I suggested to her physician that the trouble might come from this tooth, an upper right molar. The patient thought this a foolish idea, as she had had no trouble from the tooth after the gutta-percha filling was inserted. In the course of six weeks the neuritis gradually passed away, and she came in to have me replace the gutta-percha with a permanent filling. I removed the filling, and found no sensation in the cavity, so I opened into the pulp chamber and found the pulp dead. I cleaned out the chamber, then passed a probe into each of the canals. There was no sensation in either the palatal or anterior buccal roots, but when the probe reached the end of the distal buccal root she jumped and grabbed her hand. I asked her what was the trouble, and she said the old pain had returned. I waited a few moments, then passed the probe up again, with the same result. Then I asked, "Are you now convinced that this tooth was the cause of your neuritis?" Here was the pain from an inflamed pulp reflected down the arm to the fingers. As the pulp slowly died she gradually recovered from the neuritis, but when I opened the tooth there was a little vitality left at the end of this one root, and when I touched this with my instrument she felt the pain in her hand.

We must get down to facts, and teach the young men coming into the profession that there is much to learn regarding diagnosis; that they must develop this skill, and not depend entirely on mechanical appliances.

Dr. C. Frank Bliven, Worcester. A good old friend of mine in Exeter once said, "Gutta-percha will swell and stink, but there is nothing that will save teeth any better than a gutta-percha filling." If this odor, whatever it comes from, is one of its characteristics, what may we expect when it is forced through the apex of a root-canal?

I have never used any material more successfully than zinc oxychlorid. After I feel confident that everything possible has been removed from the root-canal, I moisten it with the liquid, and then make a medium thick mixture and pump it into the canal with a broach. If the air is exhausted the filling material will go as far as a broach can, if not farther. I have broken open for examination every tooth having a root-filling that has come under my observation for years, and have never found any better filled canals than those filled with zinc oxychlorid.

Before putting the liquid into the canal I use a hot wire, to be sure that the canal is perfectly dry. The action of zinc chlorid on organic tissue is explained by the chemist. I have never discovered any odor from zinc oxychlorid fillings when put in with care. In following this method, however, I concluded that it was not safe to fill the canal with zinc oxychlorid if it should become necessary to crown the tooth afterward, so after filling the canal with oxychlorid I introduce into it a gutta-percha cone, which facilitates the removal of the filling when necessary.

Dr. Spring (closing the discussion). I am certainly gratified at the amount of discussion the paper has brought out. I believe a root-canal filled completely with gutta-percha leaves no end space in the canal, and no pulp tissue which later can become a source of trouble. Infection will not get in. I think the reason we sometimes find gutta-percha with a bad odor is because it has been put in imperfectly. I have had occasion to remove gutta-percha fillings that had been in for years, and found no detectable odor. I believe the odor when present is caused by the space at the end of the canal or by a bit of pulp which dies and causes the infection.

The use of the rubber dam I believe to be a saving of time. In my present method of treating canals by putting on the rubber dam immediately and getting to the pulp chamber and the root-canal as quickly as possible, I believe that I save time by its use.

I referred to dipping the gutta-percha points in a 10 per cent. solution formaldehyd and putting them into the canal. I said I feared this method on the ground that formaldehyd is an irritant, and if the points pass through the apex of the canal this might be a source of irritation. The amount of sodium-potassium that I now use is very slight —at first we used too much. The actual amount employed should be very small. It is just as good an aid to penetration as is the acid method of Callahan. It is true that gutta-percha is not compatible with water, and it is therefore essential that the canal should be dry before filling with gutta-percha. In canals which have moisture in them, a five-minute ionization has proved the best thing I could use, either with normal salt solution and a zinc point or with a 3 per cent. solution of chlorid of zinc. The teeth are ionized from ten to fifteen minutes, according to the extent of bone rarefaction at the end of the root, with a current of about one and a half milliampères. I seldom ionize the tooth more than once. I employ hydrogen dioxid after the extraction of a vital nerve, but not until after the bleeding has ceased. I wipe out the canals with paper points. I use hydrogen dioxid to get the last remnant of blood out; and I have never, in doing so, noticed any darkening of the tooth.

I do not know whether gutta-percha can be placed to the end of the root without any passing beyond. If I could put it in just to the end, and not beyond, I should be better satisfied with my work, but I would rather have it go through than not go to the end. I think the greatest danger is where the canal is not quite filled. Twenty-five years ago the method of pumping gutta-percha through fistulous tracts was used. I have followed this procedure, and do not recall any trouble coming from its use as a result of any gutta-percha that might pass through.

Men who have had the X-ray machine for fifteen years and have taken pictures every six months as a matter of record, report that in some mouths in which they have filled the canal and the filling has protruded beyond the point of the root, they have followed the case with X-ray tests year after year, and found that even in cases with rarefied bone areas the bone has filled-in the space, and the tooth has been comfortable, with no recurrence of the trouble. I believe that as a clinical experience this is worth consideration.

While practicing in Europe I had an opportunity to see cases that Dr. Jenkins had filled with zinc oxychlorid, and I do not recall a single case in which the fillings had to be taken out. The reason I did not use this material was the feeling that the fillings are so hard that you could not take then out if an occasion should ever arise in which it was necessary.

The meeting adjourned until Friday morning.

FRIDAY—*Morning Session.*

The meeting was called to order by the President at 11 A.M. on Friday.

The newly-elected president, Dr. DAVID MANSON, Burlington, Vt., was escorted to the platform and made the following address:

Members of the New England Dental Association,—I am sorry to interrupt the discussion of the paper, but it is necessary for me to leave on the 12.12 train. I had hoped to be able to do so without interrupting the program, but find that it is impossible.

The honor of being elected to the presidency of any organization of which one may be a member is no little one. Being elected to the presidency of a professional organization is indeed an honor; and being elected to the presidency of this association I consider to be a special honor, which I appreciate and thank you for. Every organization is what its members make it, quite as much as what its officers make it; and its success depends upon the co-operation of its members with its officers. That co-operation I ask for; and with it, I hope that we may make the next meeting as successful as this one has been.

The next item on the program was the reading of a paper entitled "What Dentistry Has Done in the Present War in Europe," by HERBERT L. WHEELER, D.D.S., New York City.

[This paper is printed in full at page 800 of the present issue of the COSMOS.]

DISCUSSION.

Dr. James McManus, Hartford, Conn. I wish to call to your attention the remarkable progress that has been made in this country in the twenty-two years that have elapsed since I had the honor of being elected your first president. You see it in every direction, in the operative as well as the mechanical work that is being given to the public. From these New England states several notable dentists who obtained their dental education and training here went to Europe and made there a name for

American dentistry. As the result, you see the wonderfully good work done in Europe by Americans and natives of those different countries. Paris, in particular, as well as other parts of France, has had numerous well equipped, skilful, and scientific dentists; and this New England region, this Northeastern Dental Association, and the different state associations of New England, deserve credit for a great deal of that progress. I feel that we as dentists have a right to be very proud of these things. I am proud and glad to listen to Dr. Wheeler, one of the best-equipped men who could possibly have been sent over to Europe to note all the different improvements and good work that has been done. I also anticipate another pleasure in listening to the gentleman who is to follow him, one who has done so much to make dentistry in Europe what it is today. When I think of all that France did in help and sympathy for this country in the past, I feel glad we are now in a position to return to France in part the kindness shown by her to this country when we needed friends.

Dr. Jenkins. The instructive and inspiring address of Dr. Wheeler stirs our very hearts! With him we rejoice that members of our profession, in these days which try the souls of men everywhere, have risen to their great opportunity—the opportunity not only for service to their own countries, but also to devote all their talent and their skill to works of benevolence and mercy.

At the biennial meeting of the Canadian Dental Society in Montreal, in September, it was announced that fifty thousand recruits, rejected because of dental defects, had been so completely restored through the efficiency of the Canadian Army Dental Corps as to make them fit for service.

In Germany, even at the front and thereafter in the army hospitals in the interior, sufferers from wounds in the jaw and face receive almost immediately expert attention. At the Dental Institute of Berlin I saw in the early months of the war marvels of restoration accomplished by the united forces of the dental faculty. They modestly attributed the rapid recovery in many cases to the fine physical condition of the wounded men, but the skill, the untiring patience, and the intelligence with which they were treated were the factors of greatest importance.

We may believe with a certain degree of satisfaction that in the successful treatment of many of these terrible mutilations a knowledge of the methods and appliances of American orthodontists has somewhat facilitated the treatment.

The strain which is caused by the complicated and long-continued treatment of these cases is considerable. At last report our eminent colleague, Weiser, as head of a hospital in Vienna, was giving the entire day to such exhausting work, and was then obliged to receive some of the most necessitous patients of his private practice in the hours before midnight.

I believe that in all of the belligerent countries there are American dentists, and native dentists who have been partially educated in America, who are devoting themselves to this pressing humanitarian work. It is, however, peculiarly appropriate and gratifying that in the American Ambulance at Neuilly and elsewhere there are and have been so many of our fellow-countrymen paying something of the great debt of gratitude which we Americans owe to our ancient ally, heroic and beloved France!

Let us rejoice that in the midst of the most ruthless tragedy of all time the spirit of humanity has still survived. Surgeons and nurses in all the belligerent armies have tenderly cared not only for their own sick and wounded, but also for those of the enemy. The Red Cross of every neutral nation has had its share in this most noble work, and through the benefactions of these nations countless thousands of helpless people threatened with death by famine have been kept alive.

When at last the end shall come it should not be rulers or warriors or statesmen alone who reconstruct desolated Europe, but chiefly should the voice be heard of those who have suffered most bitterly, aided by those in every land who have felt and exercised divine compassion.

Dr. Wheeler (closing the discussion). It is very gratifying to me to have my paper discussed and completed, as it were, by two such distinguished men of the profession as these.

There is not much to answer in the discussion except that Dr. Jenkins spoke of the rapidity of recovery. I had noticed that myself. I attribute it to the fact that these men are living an outdoor life and eating plain nourishing food; but the rapidity with which even the most serious wounds heal in these soldiers is vastly greater than I have found in Bellevue Hospital among people living in the city. While the skill of these surgeons contributes greatly to this, the simple life, as it were—it could hardly be called that—but the simple eating, nourishing food, exercise, and outdoor life, all keep these men in an excellent condition physically, aside from their wounds and injuries. Unquestionably orthodontia has taught much, and has played a good part in the work. The tendency to use screws to hold appliances together in a way in which they have not been used before, cutting apart the cast appliances, and making them adjustable, I think orthodontia has been responsible for, and suggesting many of the methods employed.

Dr. BECKWITH-EWELL, Hartford. I move that a vote of thanks be extended to Dr. Wheeler in appreciation of his paper. (Motion carried.)

Dr. HUNT then read a letter from Dr. Jenkins, expressing his thanks for having been elected an honorary member of the association.

Dr. GEORGE O. MCLEAN, Hartford. I move that the thanks of this society be extended to the newspapers of the city, which have given us several good notices, both before and during the meeting.

I also move that our thanks be extended to Dr. Anthony and the DENTAL COSMOS for courtesies extended to the society. (Motion carried.)

Dr. E. W. JARVIS, Hartford. I move that a vote of thanks be extended to the retiring officers of the association.

The motion was duly seconded and carried.

Dr. MCLEAN. I move that it is the sense of this meeting that we request the incoming Board of Censors to consider Worcester as the next meeting-place of this association.

The motion was seconded and carried.

Adjourned until the next annual meeting.

REVIEW OF CURRENT DENTAL LITERATURE

[*Lancet*, London, June 2, 1917.]

The Influence of Maternal Oral Sepsis on the Fetus and Marasmic Children. By E. SPENCER PIERREPONT.

For the past nine years, Pierrepont has observed marasmic children and their mothers, and also those children who, being breast-fed, yet suffered from vomiting and diarrhea, and the conditions of the mothers' mouths were carefully noted. The clinical evidence strongly points to the septic condition of the mother's mouth having a very marked effect upon both the fetus and the postnatal condition of the child. The cases examined do not include such obvious causes as syphilis and other well-known conditions that are universally admitted to cause stunting in growth or wasting in children, etc., but are all cases where clinically nothing of a pathological nature was found in the mother other than in the mouth.

Twenty typical cases are given in this report in pertinent detail. Some 500 such cases from hospital practice furnish the evidence for the following conclusions:

(1) The toxins from the maternal oral sepsis have a very strong influence in a large number of cases upon the vitality of the rapidly growing fetus, so that the child is handicapped from before birth with a lowered vitality, and therefore the marasmic condition is antenatal in its inception.

(2) Prematurity of birth and miscarriages, where no other cause can be discovered, are brought about by the toxic state of the mother induced by the septic condition of her mouth.

(3) The diminution in the quantity or alteration in the quality of the mother's milk, where no other cause can be ascertained, is due to the selective affinity of certain toxins for certain secretory cells of the mammæ; and where no such diminution or alteration can be demonstrated, then the toxins, and in some cases the micro-organisms themselves, are in the milk.

(4) In the toxemias of pregnancy and the puerperium the high pressure at which the emunctory organs are working is probably adversely influenced by the toxic state produced by the mouth, and this is the deciding factor that in many cases just brings the balance down on the wrong side, and results in eclampsia or other toxemic conditions.

The experiences and views of Pierrepont have been exactly paralleled by G. B. Harris (*Dental Summary*, September 1916), and by Waller (*Lancet*, November 4, 1916; reviewed in the DENTAL COSMOS for January 1917).

[*American Journal of Physiology*, Baltimore, May 1, 1917.]

The Composition of the Saliva in Relation to the Incidence of Dental Caries. By JOHN ALBERT MARSHALL.

After a few words of historical orientation, referring particularly to the controversial observations of Gies, Marshall states the two problems of this study—(1) the origin of the change of the neutralizing power of the saliva which occurs in response to certain stimuli, and (2) the significance of this change in relation to the incidence of dental caries.

The first problem is approached from two avenues of attack; that is, by dialysis experiments and by the determination of the amino-nitrogen content of the various samples of saliva after hydrolysis, with a view to estimating more exactly the part played by protein in contributing to the difference in properties and composition between normal resting and activated salivas. The data from these experiments respectively indicate (1) that the greater percentage of alkalinity and acidity is found in that portion of the sample which has dialyzed through the membrane and is due, therefore, to the inorganic constituents, and (2) that in the greater percentage of those cases which were classed as immune from dental caries, the nitrogen content of the normal resting saliva is appreciably higher than that of the paraffin-activated saliva.

The second part of Marshall's report deals with the relationship of dental caries and the composition of the saliva to dietary conditions, and the locality and nature of the stimuli promoting secretion. As a result of a review of the literature it appears that protein-eating races are as susceptible to dental caries as those whose food is mainly carbohydrate, and that the teeth of primitive races are not even relatively immune to dental caries.

In studying the relation of type and locality of stimulus to the neutralizing power of the secretion of saliva evoked by the stimulus, the electric current was employed. These experiments afford data which Marshall interprets as showing that—(1) The alkalinity of electrically stimulated saliva is lower than that of the paraffin sample; (2) the acidity of the former is relatively higher than that of the latter, and (3) the neutralizing power of the saliva obtained by electric stimuli is lower in every instance than that collected by the paraffin method. The amount of current used and the locality at which it is applied did not appear to produce any marked deviation from the general result.

It is most interesting to note, although Marshall does not emphasize it, that the repeated use of the inductorium on an individual produces a marked effect upon the relationship of the normal resting saliva to the paraffin-activated saliva. This electric irritation alters the factor in a few days from one which is comparatively low to one with a much higher valuation.

The paper concludes with a summary of results of attempts to determine the reaction of the saliva to gustatory impulses. This problem was attacked by comparing the results obtained with a normal resting sample with those secured by the use of different substances of marked taste. As a result Marshall decides that the action of sucrose tends to lower the total neutralizing power of the saliva, and that quinin brings about the opposite condition, *i.e.* a saliva resembling that secreted in response to the stimulus of chewing paraffin. The phase just mentioned above of the action of the sucrose becomes most significant when taken into consideration with the importance assigned by Miller to fermentable carbohydrates in the production of dental caries.

[*Den Norske Tandlaegeforenings Tidende*, January 1917.]

The Gingival Region of the Tooth, and in Particular the Anatomical Relation Between the Enamel and the Cementum.

By Gunnar Thorsen.

The first part of this paper gives a rapid sketch of the different tissues of the tooth and their relation to each other, including the surrounding soft tissues. Special attention is given to the gingival part of the tooth.

The second part of the paper deals with the anatomical relation between the enamel and cementum, based upon the microscopical study of about 45 teeth (65 sections) as far as possible normal. Johan Rygge, an authority in Scandinavia on matters of dental histology, in part supervised the work of Thorsen. Choquet (*L'Odontologie*, 1889) made a similar study—based, however, on a smaller number (29) of teeth.

Thorsen's results are as follows:

(1) Cementum covers part of the enamel: In 60 to 65 per cent.

(2) Enamel covers part of the cementum: Only once in all 65 sections.

(3) Tissues meet edge to edge: In 30 per cent.

(4) Gap between tissues: In 5 to 10 per cent.

As a rule, perhaps in 90 per cent. the same anatomical relation exists between the tissues on the different axial planes of the teeth.

These figures are at variance with those given by Choquet. The importance of the gingival region for so many dental procedures makes this study very welcome, and warrants further extension of such researches.

[*Journal of the Allied Dental Societies*, June 1917.]

Motion Study in Dentistry.

By Frank B. Gilbreth.

A topic of this nature is a distinct novelty in dental literature. Gilbreth's treatment of this theme is simple and persuasive, and full of common sense. "The value of motion study is highly appreciated in every phase of modern industry. It has already, although for the most part unconsciously, been extended to the professions; . . . an afternoon in one of our great surgical clinics will convince anyone of the truth of this."

A large part of the dentist's work has to do with the successful handling of his own muscular equipment, and "technical skill" is only another way of describing ability to recognize one's body as a machine, and to use this machine in the most efficient way possible. The dental profession needs to recognize the fundamental principles of efficiency. Efficiency has been well defined as "finding out what you want to do, and then doing it in the best and cheapest way." This involves activity, which motion study considers from the motion standpoint. There are three parts to this study—(1) Variables of the worker, (2) variables of the surroundings, equipment and tools, and (3) variables of the motion itself.

The first division includes a review of all characteristics, acquired both through heredity and through education and environment. Specialization or functionalization is inevitably indicated. Functionalization is primarily a method for attaining greater efficiency by assigning to each worker the work that utilizes his high-priced motions only, by allowing him to work the greatest number of minutes possible at the highest type of work of which he is capable. The tendency in this direction in dentistry is very marked. Already the specialist in orthodontia, in radiography, in prophylaxis, in crown and bridge work, in the treatment of pyorrhea, in extraction, etc., is no stranger even to the layman in our larger communities.

The second part of the study shows that the primary requirement for the surroundings, equipment, and tools is measurement, and, as a result of this, standardization. A realization of the need of such standardization has been progressing in dentistry in recent years. The professional motion student, or efficiency expert, begins this phase of his work by a survey—and, to quote Gilbreth, "Nothing will prove so interesting or so stimulating to you as an attempt to make a survey of your own working conditions and your own practice, and then to review this intensively." Super-skill with a few tools is more to be desired than a moderate amount of skill with each of many tools.

The third phase of motion study deals with the variables of motion itself. The problem of fatigue arises here prominently. Its elimination for the patient has been thoroughly, if not always scientifically, considered. Fatigue elimination for the dentist is as yet negligible. Motion economy also involves a consideration of delays, the reasons why they occur, and a reconstruction of the method to such an extent that avoidable delays are eliminated, and that unavoidable delays are made rest periods or otherwise utilized in some way. With this will come not only a better placing of materials but a better routing of materials. The cinematograph, which already has been introduced for dental teaching, is capable of affording records of motions employed in dental operations, which records can be intensively studied and therefrom corrections of posture, muscular habit, etc., can be indicated.

The great and most important result of the motion study will be the change in the mental attitude of the dentist. Motion study is of valuable educative significance to the dentist, to the patient and public, and to the prospective student of dentistry. The purpose is to standardize the work of the profession, the tools and equipment by which the work is done, and the type of people who are permitted to do it.

[*Annals of Surgery*, March 1917.]

The Treatment of Bony Defects of the Lower Jaw. By Clarence A. McWilliams.

The main lessons to be gathered from patients suffering from bony defects of the mandible are as follows: (1) Infection from the mouth at the time of making the grafts is absolutely fatal to the entire graft. (2) Infection appearing weeks after the grafting, not dependent on immediate connection with the mouth, is by no means fatal to the entire graft. A part only of the graft may necrose away. (3) No grafting should be made in the presence of a sinus or into a granulating cavity. (4) Grafting should be performed any number of times until a successful result is obtained. (5) In view of the great liability of bone-grafts into the lower jaw to infection, the author is inclined in his next cases to use costal cartilage, as more viable than bone-grafts, and less apt to become infected. (6) Absolute immobility of the jaw is a *sine qua non* to a successful result. Wiring the teeth has proved, in the author's experience, more successful than splints. (7) The inlaying of the graft, always with the periosteum, into grooves cut in the sides of the fragments would seem to be a more scientific procedure than an end-to-end grafting.

[*Journal of the American Medical Association*, June 2, 1917.]

Epidemic Ulcero-membranous Stomatitis (Vincent's Angina) Affecting Troops.

By A. R. Campbell and A. D. Dyas.

This report is based upon 129 cases, which are discussed so as to indicate the routine, laboratory, and ward observations which may be expected to be encountered. This disease is now so prevalent on the western front that it may be classed as among the commonest disabilities of troops. Vincent's angina is an infectious disease of the mucosæ of the mouth, throat, bronchi, and prepuce. By far the most frequent site of infection is in the mouth and throat. Next in frequency are the bronchial cases. The preputial cases are rare.

The authors differentiate four types of Vincent's angina of the mouth and throat.

Type I, tonsillar, numerically the most frequent. Yellowish-gray membrane covering one or both tonsils; breath fetid, some difficulty in swallowing, enlarged and tender cervical lymph nodes. Absence of headache, myalgia, and marked prostration differentiate this disease from diphtheria or acute tonsillitis. Removal of membrane leaves a freely bleeding surface. Temperature slightly elevated, though it may be as high as 103.5 F. Pulse and respiration are but slightly elevated.

Type II, next most frequent, characterized by deep ulcer on ramus of lower jaw immediately behind the most distal molar. In many cases the posterior edge of the ulcer is swollen, so that it projects over the crown of the tooth, making mastication practically impossible. In untreated cases there is a tendency for this type to develop into type III.

Type III, pyorrhea caused by Vincent's organisms, relatively frequent. Usually, in an otherwise healthy mouth, this type is at first limited to the regions of the maxillary and mandibular incisors. Gums swollen, spongy, tender, bleeding easily. In advanced cases teeth become loose, and may even drop out. Any condition, as mercurial treatment, tending to lower the vitality of the gums predisposes to a speedy infection with Vincent's organisms. Decayed teeth or any mechanical injuries to the gums frequently form a nidus for infection. The frequency of this pyorrhea about the incisors is, in the opinion of the authors, due to injury of the gums in biting.

Type IV, general infection of the mouth, the most severe type; patient acutely ill. Membrane extends over cheeks, tongue, fauces, pharynx, and palate, even to the lips. Where the cheeks come in contact with the teeth ulcerations may occur. Tongue much swollen, difficult to speak or swallow, margin of tongue deeply indented with ulcers corresponding to each tooth. The ducts of the parotid and submaxillary glands may become involved in the infection. The history of a concrete case is given.

The incubation period of the disease is as yet unknown. Two cases were seen in men landing from Canada, who, three weeks before, had perfectly healthy mouths.

Microscopic examination of smears from the membranes is of greatest value in a differential diagnosis from diphtheria. Carbol-gentian violet is the stain recommended. In a few cases diphtheria and Vincent's angina were coexistent. This condition is rare. The mercurial treatment of syphilis often conditions the association of these two diseases. In cases of Vincent's angina with no syphilitic history, the Wassermann reaction is always negative. A healing ulcer about the mouth or throat will almost invariably be mistaken for a syphilitic mucous patch. When the case belongs to type III, the history is usually given of a long-standing pyorrhea, and the endamœba gingivalis is frequently found along with Vincent's organisms.

The Dental Cosmos has, in June 1917 issue, p. 663, given some of the methods of treating this newly prevalent malady. In addition to what already has been given, the following seems important: "Arsenic is undoubtedly the most useful remedy, especially in the form of salvarsan or neosalvarsan. As these drugs are expensive and difficult to use, their employment is infrequent. For ulcerations about the mouth and tonsils, our routine treatment is liquor potassii arsenitis swabbed on three or four times a day. Where the ulcer is deep and spreading rapidly it is first well swabbed with 10 per cent. silver nitrate solution, and the treatment continued with the liquor arsenicalis. . . . In general stomatitis and gingivitis the patient should be given large doses of liquor arsenicalis internally, sodium cacodylate hypodermically, or salvarsan. He should then frequently use a soothing antiseptic mouthwash until the condition is sufficiently under control to permit local treatment. The majority of cases are cured in from 4 to 7 days. We have had few returns of patients discharged as cured."

[*Pennsylvania Medical Journal*, Athens, June 1917.]

The Dakin-Carrel Method of Wound Sterilization. By W. O'Neill Sherman.

The author had unusual facilities to study this technique at the front, and consequently his report is comprehensive and practical.

The Dakin solution, as now in use, is prepared according to the technique of Daufresne. The chlorinated lime must first of all be titrated. Assuming it to contain 25 per cent. of available chlorin, the quantities of necessary substances to prepare 10 liters of solution are the following: 200 gm. chlorinated lime; 100 gm. sodium carbonate dry (soda of Solway); 80 gm. sodium bicarbonate dry. Put in a 12-liter flask the 200 gm. of chlorinated lime and 5 liters of ordinary water, shake vigorously for a few minutes, and leave in contact for six to twelve hours—one night, for example. Shake until dissolved, at least until the big pieces are dissolved. Not all the pieces will dissolve—large pieces float; notice only the floating pieces. At the same time, dissolve in 5 liters of ordinary cold water the carbonate and bicarbonate of soda. Leave for from six to twelve hours; pour the salt solution in the flask containing the macerated chlorinated lime, shake vigorously for a few minutes, and leave in order to allow the calcium carbonate to be precipitated. In about one-half hour siphon the liquid and filter with a double paper to obtain a good clear liquid, which should always be kept in a dark place.

The Dakin solution must now be titrated. The hypochlorite content must be between 0.45 and 0.50 per cent. Further, the solution must be free from caustic alkali. To test this, pour into a glass about 20 cc. of the solution and drop on the surface of the liquid a few centigrams of phenol-phthalein in powder. The correct solution does not give any coloration.

Never heat the solution. If in case of urgency one is obliged to resort to trituration of the chlorinated lime in a mortar, only employ water, never salt solution. The stock solution should be kept in blue or brown colored bottles, well corked; in a cool place. It should never come in contact with alcohol, nor should it be applied or used in the eye or intravenously, because of its hemolytic action.

The preparation of the hypochlorite solution is very important. Attention must be scrupulously directed to every nicety of detail; but of even greater importance is the manner in which this solution is applied, as devised by Carrel. Sherman discusses this phase at some length, but the principle of the method is best outlined in the words of Dr. W. W. Keen:

"A reservoir containing Dakin's fluid is hung one meter (39 inches) above the level of the wound. From this reservoir one large tube controlled by a pinchcock leads to a glass tube with several branches like the teeth of a comb. From these multiple tubular teeth several small rubber tubes are so disposed as to reach every part of the wound. The far ends of these small tubes are tied, but the fluid escapes through several very small holes one millimeter ($\frac{1}{25}$ of an inch) in diameter in the sides of the tube, and so is kept constantly in contact with the entire internal surface of the wound.

"Every two hours day and night, for only one or two seconds, the pinchcock is opened and a little more fluid is sprinkled in minute streams through the side holes of the small tubes to every part of the wound. It is not intended that the fluid shall run over and soak dressings or the bed. It is only intended to fill the wound in every possible recess, and to keep the antiseptic fluid in contact with the entire inner surface of the wound all the time. By this means, wherever there are any bacteria in any part of the wound the antiseptic fluid is constantly at work destroying them. The aseptic technique must be perfect. Not even a gloved finger is allowed to touch the wound. Everything — dressings, tubes, etc.—is handled by thoroughly disinfected forceps.

"Every second day, microscopic examination of the discharge from the wound is made in order to count the number of the bacteria. At first they are innumerable. From day to day they diminish, and in a short time but few are found. When they have practically disappeared for several days the wound, which so far has remained open, is closed by sutures, and it quickly heals."

The advantages of the Carrel-Dakin treatment are (1) shortened time of disability, (2) lowered mortality, and (3) less cicatricial tissue and therefore better function.

Carrel has made a number of exhaustive experiments with chloramin paste, in which sodium stearate is used as a base. This paste should only be used for superficial wounds. The general appearance of wounds paste-treated is totally different from those treated by the Dakin solution, but bacteriological examinations show that the results obtained are identical. The paste is used to simplify the method of dressing.

From this, it seems logical that some such paste as this would be the best adapted of the various chlorin compounds to be applied to pyorrhea pockets.

[*Dental Summary,* Toledo, Ohio, May 1917.]

Helpful Suggestions for Everyday Practice. By Arthur H. Merritt.

Every dentist has enjoyed the privilege of a somewhat wandering gossipy conversation upon the actualities of general chair practice with an alert and progressive *confrère.* Just such enjoyment is to be derived from a perusal of Merritt's paper.

Among other suggestions of value is the description of the preparation of a cavity varnish for teeth sensitive to thermal shock. Gum dammar 1 dram; zinc oxid 1 dram; Canada balsam 5 drops. Fuse and pour into shallow molds. This is best done by first melting the gum dammar and stirring in the zinc oxid and Canada balsam. It is then to be transferred to a container, and allowed to cool, when it is ready for use. A pellet of cotton saturated with chloroform is rubbed on the surface, which exercises a solvent action on the preparation. When thoroughly saturated it is transferred to the prepared tooth cavity, the surface of which is coated with the varnish. If a heavy coat is desired, a second application may be made, having evaporated the chloroform from the first application. The edges are then cleaned and the tooth is ready to be filled. The surface of a cavity so treated will have a white and glistening luster. Used this way it is almost absolute as a thermal non-conductor.

This same preparation is also extremely useful in protecting hypersensitive dentin against the action of the acid in cement fillings.

In cases where there is marked cervical sensitivity, due to a slight abrasion or to erosion, inducing slightly hyperemic pulps, excellent results may be obtained by washing the teeth with warm alcohol, thoroughly drying, and painting the involved surface with the varnish, usually making two or three applications.

An excellent temporary stopping may be obtained by mixing oil of cloves with zinc oxid. The zinc oxid should be slowly added, and thoroughly spatulated on a ground-glass slab. Success depends upon incorporating all the oxid which the liquid will take up. Its sedative effect makes it most useful as a temporary stopping in aching teeth with vital pulps. The fact that the cavity does not need to be dry adds to its usefulness. It may also be relied upon to seal medicaments in a tooth, provided it is not subjected to direct pressure from occluding teeth. When applied to cavities on approximal surfaces or on the buccal surfaces of molars it will last for months, completely protecting the tooth.

In the treatment of pyorrhea alveolaris the correction of occlusal trauma is a much neglected factor. Merritt insists upon the necessity of the careful adjustment of the occlusal planes and incisal edges of teeth, as is shown to be necessary, by thin carbon paper. This is best done by small stones of assorted sizes and shapes as made by Miller.

The exquisitely sensitive condition of the gums which at times complicates the treatment of pyorrhea may be relieved, according to Merritt's experience, by introducing dentalone (Parke, Davis & Co.) or phenadyne (Schieffelin & Co.) upon small wisps of cotton in the pockets.

Small artery or hemostat forceps of various sizes are recommended for the easy removal of a toothbrush bristle or a piece of floss silk. These instruments are also well adapted to grasp and remove rubber dam ligatures, any of the textiles used in separating the teeth, wire bristles placed in root-canals before X-raying, etc.

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

EDWARD C. KIRK, D.D.S., Sc.D., LL.D.

PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, AUGUST 1917.

EDITORIAL DEPARTMENT

Standardization of Dental Operative Procedures.

ONE of the many beneficial results arising from the activities of the dental profession in its endeavor to avoid the grave evils charged to unhygienic crown and bridge work by Sir William Hunter in his epoch-making address in 1910, when he condemned the entire system of crown and bridge work as then practiced by the dental profession, has been an awakening to the realization that more important than the mechanical perfection of the apparatus placed in the mouth is the proper preparation of the teeth which are to support the fixture. Subsequent investigations by the dental and medical professions have clearly proved that the ills which may arise from foci of infection about the roots of teeth which have been imperfectly treated and filled may be relatively more serious in their nature and results than those arising from unhygienic conditions made possible in the mouth as the result of faulty crown and bridge work.

When the mechanical perfection of crown and bridge work had been practically achieved, the attention of the profession was drawn, through the notable work of Rosenow, Billings, Grieves, Hartzell, and many others, to the necessity of devising a safe and sane method of root-canal treatment and filling, and in the nature of the case the result has been that almost as many methods have been devised for this operation as there are operators performing it. Many of our ablest operators have been at work on this problem, the inevitable result of which has been a realization of the need of recognized standards in our operative procedures, a forceful expression of which is voiced in the article at page 777 of the present issue of the Cosmos, in which the author, Dr. Arthur B. Crane, makes a strong plea for such a standardized method of procedure in root-canal work.

The profession has long realized the need of standardization of operative procedures, as well as of the instrumentarium for performing the operations incident to operative dentistry, and we have had forced upon us as the result of the present war emergency the demand for a standardization of the dental instrumentarium as an economic measure. As the result of this economic demand, the Government, through the Medical Board of the Council of National Defense, has appointed a special committee of dentists to undertake such a standardization of the instruments used in dental operations. This step of itself must necessarily tend toward eventual standardization of methods of procedure in the teaching and practice of dentistry. As urgent as the need has been for co-ordinated effort toward such standardization, little has been accomplished in this direction aside from the valuable work of the late Dr. G. V. Black in his praiseworthy effort to standardize the operation of preparing cavities for fillings, and his notable work in giving to the profession a standard formula for dental amalgam alloys.

Almost coincident with the realization of the necessity for better methods of root-canal treatment and filling came the application of the radiograph to dentistry, and while its usefulness in solving dental problems has not been developed to its fullest extent, we feel assured that it will eventually prove to be a valuable aid in evolving a method of root-canal treatment and filling which will meet the demands of both the dental and medical professions. The tendency at present, however, appears to be too much toward relying solely upon the radiograph as a means of diagnosis. While the radiograph is an invaluable adjuvant in diagnosis, its greatest value, we believe, will be as supplemental to clinical observation and study of periapical conditions. One of the most important features of the diagnostic problem is to determine those teeth which are hopelessly involved and therefore need to be extracted, and those which the dental practitioner can reasonably hope to save and make useful members of the dental mechanism, and it is in this respect that radiography will undoubtedly prove of inestimable value to the dental practitioner.

Many over-zealous operators have been inclined in the treatment of root-canals to go to extremes in the amount of time and attention given to a single tooth---some operators claiming that it is necessary to devote as many as eight or ten hours to the proper preparation of a root-canal for filling. Such an amount of time given to the treatment of a single tooth places the operation upon the plane of a luxury which only the wealthy class of patients can afford, and therefore deprives a large and worthy class of patients of a valuable service. This we feel is an unnecessarily extreme position, and only serves to emphasize more forcibly the need for a standardized method of procedure in root-canal work that will enable the average operator to arrive at the best results after an expenditure of energy and time the monetary equivalent for which is within the means of the average person.

The question of materials with which to fill the root-canal after it has been properly prepared to receive a filling has come in for its full share of consideration and investigation, and materials almost innumerable have been advocated and used for the purpose. It is our opinion, however, that, other things being equal, the manner in which the filling is inserted is of even greater importance to the welfare of the tissues than the particular character of material employed.

One of the salutary effects that will necessarily come from a further consideration of this tedious and trying operation will be a clearer realization of the responsibility of the profession in bringing to fulfilment the prophetic utterance of Dr. Charles Mayo in 1911, when he said that the next great step in preventive medicine must come from dentistry. It would seem that our greatest hope of avoiding the ills that may come from foci of infection about the roots of devitalized teeth will be realized in more assiduously endeavoring to prevent devitalization, thus avoiding the necessity of what is, to say the least, in the light of our present knowledge of the problem, a questionable procedure.

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PERISCOPE

Anchor Pins for Reconstructing Badly Broken-down Molars and Bicuspids.—There are many anchor pins on the market, but to my mind they are all too heavy and clumsy. I shall give a quick and convenient way of making them. In your draw-plate, draw down some nickel silver wire, in the square holes, to the gage of ordinary orthodontia expansion arch wire—the result is a square wire. I have a small tapping die which gives the thread of an orthodontia arch; through this run the square wire, and then cut it up in lengths of about a quarter of an inch, the result being the finest anchor pins obtainable. They are easily held in the tweezers, due to the square sides, and when being carried into the root-canals (which, by the way, have been enlarged by a rosehead bur) the surplus cement is allowed to ooze up the square sides, facilitating the insertion of the pin and preventing undue pressure on the apical filling. While the cement is still soft, complete the operation by packing "true dentalloy" around the pins and fill the cavity. Complete the restoration according to anatomical requirements.—H. R. GREENWELL, *Dental Record.*

Interpretation of "Dark Shadows" in Radiographs.—Clinical results are flatly contradicting the assumption that every shadow upon the root of a tooth in a radiograph is a focus of infection, and laboratory experiments in those same cases are likewise giving negative results. A shadow on the apex of a root may indicate one of several things, herein including the filling-up of the cancellated spaces in the alveolar bone by a proliferation of the soft tissue which normally fills the cancellated spaces. If as the result of an involvement of the alveolar bone, following an infection emanating from the pulp or pericemental membrane, some of the cancellated spaces are destroyed, as occurs in osteomyelitis, following or simultaneous with an inflammatory proliferation of the myelitic substance—the substance contained in the cancellated spaces—a dark shadow will be brought out upon the radiograph even though all bacterial elements be absent, *i.e.* the density of the area has been materially decreased by the filling-in of the enlarged cancellated spaces by soft tissues. Again, in the case of a chronic infection of the peridental membrane which has spread to the alveolar process, causing the loss of osseous substance with perhaps practically no attempt at obliteration of the space by organic tissue, a dark shadow will be shown on the plate even after complete eradication of the infection.

Another misconception of root pathology is in the tendency to regard dark shadows upon radiographs as evidence of the presence of granulomata; viz, tumors or enlargements of the peridental membrane made up of a large number of embryonic connective tissues containing within its meshes epithelial elements, or again, made up entirely of connective tissue. The number of teeth which we have examined after extraction which upon previous radiographic examination showed fairly large blackened areas adjacent to the apical region leads us to the conclusion that the presence of granulomata is the exception rather than the rule.—EDITORIAL, *Pacific Dental Gazette.*

The Radiograph in Diagnosis of Impacted Teeth.—The X-ray, "that instrument of precision," renders the diagnosis of impacted lower third molars positive, certain, and exact. Its use saves time, trouble, confusion, doubt, and possibly the patient's life.

In every case in which impacted teeth are suspected or considered a possible cause of local or systemic disturbances, the patient should be advised to have a radiograph made as soon as possible.

A radiograph is not only a positive, a certain, and an exact means of diagnosis, but it is of inestimable and unquestioned value as a guide for the operator in the removal of impacted teeth.

The radiograph will not only show whether or not an impacted tooth is present, but will show the position of the tooth, the size and direction of the roots, the proximity to the inferior dental canal, and with some degree of accuracy the density and conformation of the jaw-bone. It will disclose whether or not the tooth is abscessed, the roots excementosed or absorbed, the bone necrosed or destroyed.

After the tooth has been extracted, the radiograph will render another service—it will satisfy both patient and surgeon whether or not the operation was thorough, complete, and successful.

Did the X-ray serve no useful purpose other than that of locating impacted third molars and diagnosing conditions associated with them, it would be a great boon to the dental profession and those to whom it ministers.—A. M. Nodine, *Journ. National Dental Association.*

The Influence of Ether and of Nitrous Oxid on the Histologic Structure of Various Organs.—As far as nitrous oxid is concerned here is found another resemblance to normal sleep. During normal sleep the histologic changes in the brain, the suprarenals, and the liver caused by exertion, emotion, infection, acid injection, etc., are repaired; during nitrous oxid anesthesia also, the lesions in the brain cells due to these causes are repaired, and, as will be seen later, nitrous oxid exerts a measurably protective action on the suprarenals and liver as well. This protective action of nitrous oxid was strikingly demonstrated in a series of experiments on insomnia. A group of rabbits were kept awake continuously for approximately 100 hours. At the end of this period, their brain cells showed the typical physical changes of exhaustion. In another group these changes were partially restored after a single séance of sleep; while in still another group, in which the rabbits were allowed no normal sleep, but were placed under nitrous oxid anesthesia for one hour out of every six during a period of approximately 100 hours, the brain cells, as in the rabbits allowed to sleep, showed marked restoration, some cells, indeed, being in a *plus* normal state.

A comparative study of the effects of ether and of nitrous oxid was made by keeping dogs under continuous anesthesia for four hours. After four hours' continuous ether anesthesia, striking histologic changes were found in the brain, the suprarenals, and the liver; while after four hours' continuous nitrous oxid anesthesia, there were practically no changes in the brain, and but slight changes in the liver and suprarenals.—G. W. Crile, *Dental Summary.*

Relation of Abscess to Systemic Conditions.—I have a series of about twenty roentgenograms of a single tooth which was abscessed. I put in a gold filling in January 1914. The tooth was an upper canine; the pulp was alive. The patient came back the latter part of July with an acute abscess. A roentgenogram was taken soon after the abscess was lanced, showing quite a cavity in the bone into which the root-end projected. I believe the pulp had died soon after the filling was placed, and there had developed a chronic alveolar abscess which had destroyed the bone long before this acute abscess occurred.

I have had roentgenograms taken at different intervals during the past three years, and those taken a few months after the removal of the pulp show the bone built in about the end of the root, apparently a perfect result. But another picture, taken three months later, shows a hole in the bone again; another six months later shows it partly built in. What do these changes represent? To me they represent different stages of resistance and reinfection. There may be no pus there at times, and some men would say the condition is a safe one. There may be nothing but granulation tissue; it may not be much inflamed; it goes on for weeks, or months, or years without giving trouble. But suppose the patient's tonsils become infected? The infection gains access to the circulation and attacks that granulation tissue about the root apex, and more or less of it is destroyed. It is a weak spot which is unsafe. With an epidemic of tonsillitis, we usually have an epidemic of alveolar abscesses, which means that the granuloma have been the subject of renewed attack.—A. D. Black, *Journ. Allied Societies.*

Why Teeth Decay.—Before explaining why teeth decay, it may be well to remind you of one important fact, namely, that decay in teeth invariably starts from unhygienic conditions outside the tooth. The chemical composition of the tooth has nothing whatever to do with the initiation of decay, and it is therefore absolutely futile to attempt to prevent decay by giving the mother, the infant, or the child, food or liquids which might be supposed to influence the chemical composition of the tooth. Unless the child becomes diseased during the formation of the enamel it is practically as impossible to alter the chemical composition of the tooth by different varieties of foods as it is to alter the color of the hair by varying the method of feeding.

Teeth decay for one reason, and one reason only. The reason is that certain kinds of foods are liable to lodge for a long time, generally in the crevices of or between the teeth, and therein to undergo a process of fermentation, giving rise to the destruction of the enamel, and later to the softening and putrefaction of the deeper parts of the teeth. Fortunately, only certain kinds of foods give rise to the formation of acid in such a way as to destroy the enamel. The foods are known to chemists as carbohydrates, and to the public as sugary and starchy foods. Fortunately, too, many sugary and starchy foods do not tend to lodge about the teeth in such a way as to give rise to harmful effects.—J. SIM WALLACE, *Brit. Dental Journal.*

Surgical Removal of Tonsils.—That the uses of these lymphoid structures are so little understood is no reason for counting every prominent tonsil or adenoid in persons of school age as a defect. Indeed, there seems to be a wholesome reaction against the operations on tonsils in youth merely because they are prominent and noticeable. At the Johns Hopkins Hospital, for example, the practice is to regard the tonsils and adenoids in children as physiologically important parts of the mechanism which protects the lower air-passages from dust and organisms. If there is no mouth-breathing, no evidence of damage to the ears, no chronic enlargement of the glands of the neck, no cystic condition of the adenoids known as Thornwald's disease, and none of the so-called "reflex neuroses," the removal of adenoids regardless of their size or appearance is not recommended.

On the other hand, recent years have witnessed a growing interest in management of diseased tonsils and a widespread appreciation that the germ of tonsillitis may lodge in many spots far removed from the local seat of obvious disorder. Tonsillar and nasopharyngeal infections have of late frequently become related, for example, to infectious and rheumatoid arthritis, myositis, and acute rheumatic fever, to chorea, to hyperplasia of the cervical glands, and even to nephritis. If these relationships and other indications of the involvement of the tonsils as portals of entry for harmful micro-organisms could be convincingly established, the indications for the removal of the tonsils both as a prophylactic and as a therapeutic measure would become clearer and more rational.—EDIT., *Journ. A. M. A.*

An Easy Method of Making a Bicuspid Richmond Crown.—In making this bicuspid Richmond crown, the root preparation is the same as for any Richmond crown. You take the gingival measurement and adapt a gold band to the root, then solder a flat plate of gold to the gold band. Prepare the root or roots for the post and solder the post or posts to the gold plate foundation.

Take the bite and impression; articulate, and then you are ready for the selection of the tooth. Purchase a pinless bicuspid porcelain crown of size (as per model) and length (as per bite) of any standard manufacture. Adapt the porcelain crown to flat gold preparation at the gingival, and to perfect occlusion. Then take the post that comes with the porcelain crown and cut away that portion intended for the root, retaining that small stub which fits in the porcelain crown. Grind this stub while in place in the porcelain crown so that it is just level with the base. Place a speck of beeswax on the center of the gold base; then adapt porcelain crown containing this stub of the pin to the gold base, using slight pressure. Withdraw the porcelain crown, leaving the post pin adhering upright to the gold band by means of the beeswax.

At this point remove the band and dowel from the plaster cast. Make a hole in the charcoal soldering-block large enough to take the post, insert the post in this hole, and bring the plate of gold so that the band rests on the soldering-block. The stub of pin, which is resting on plate of gold by means of beeswax, can be held in place by a pair of spring tweezers, one point of which is inserted in the side of the charcoal soldering-block, the other point resting upon the top of the pin. Solder the pin to the gold-plate base with any low-karat solder without investing. Cement the porcelain crown on this post and polish the gold band.—OSCAR MIESSE, *Dental Summary.*

Dakin's Solution in Dentistry.—I wish to call the dentist's attention to Dakin's solution. This wonderful antiseptic, which has revolutionized the treatment of wounds in the war hospitals of France and England, first suggested by Dr. H. D. Dakin of the Rockefeller Institute, is just as invaluable in dental practice as it is to the general surgeon. In dental surgery for post-operative irrigations and dressings, for irrigating pyorrhea pockets, and for sterilizing root-canals, it has no equal. I say this after several months' trial.

Formula for Dakin's solution:

Chlorid of lime,	grams	200
Sod. carbonate,	"	100
Sod. bicarbonate,	"	80
Aqua pura,	liters	10

Allow to stand over night and filter through cotton. This makes a little over 21 pints, and does not deteriorate by standing.

In treating root-canals, after the canal is well opened through the apex, irrigate with Dakin's solution and seal a Gillett absorbent point, wet with the solution, in the canal for several days. This is done with the rubber dam in place; repeat as often as indicated. To determine sterility, introduce a Gillett point well into the canal, then saturate with a sterile saline solution by means of a hypodermic syringe; then take up surplus moisture with sterile cotton, seal, and allow to remain for one week. Any organisms near the apex will be drawn in by capillary attraction and found upon the Gillett point. This point is then put in bouillon culture and incubated for 48 hours. If at the end of this time the bouillon is sterile, the root-canal can be filled with a reasonable assurance of safety. If the bouillon is contaminated, further treatment or extraction is indicated. Personally, I am persuaded by the character of the organism as to my conclusion.

Dakin's solution sterilizes by liberating chlorin, which has strong antiseptic properties, and by irritation induces hyperemia. I mentioned some time ago that hyperemia, to my mind, was the most potent agent in ionization. I am gratified to observe other investigators recognizing this fact. With Dakin's solution we get both chlorin and hyperemia, and so the patient does his ionization at home instead of in the dental chair, if I may put it that way.—H. J. KAUFFER, *Journ. of Allied Societies.*

OBITUARY

Dr. William M. Wright.

DIED, May 23, 1917, in the Robert Packer Hospital, Sayre, Pa., of septic pneumonia, following an operation, in his twenty-eighth year, WILLIAM MINNIS WRIGHT, D.D.S.

Dr. Wright was born June 14, 1889, at Union City, Pa., the son of Mr. and Mrs. Delos M. Wright. He obtained his early education from the public schools of that vicinity, being graduated from State College, and later from the dental department of the University of Pennsylvania in 1911.

Immediately after his graduation from the University of Pennsylvania, Dr. Wright associated himself in the practice of dentistry with Dr. Harry M. Beck, Wilkes-Barre, Pa., which association continued until the time of his death. Dr. Wright quickly became one of Wilkes-Barre's most popular professional men by reason of his pleasing personality and his unusual ability as an operator. He was a zealous student of dentistry, and his untimely death undoubtedly deprived the profession of the results of valuable research work that he was preparing himself to undertake. That he was eminently fit to undertake research work was evident to all who knew his professional ability and his mental qualities.

Dr. Wright had just answered the call of his country to duty in the present war emergency, having made application for enrolment in the dental surgeons corps of the army, and had gone to Sayre to undergo a slight operation which was necessary in order for him to pass the army physical examination, when his death occurred.

The funeral services were held from the home of his parents, Union City, Pa., May 25, 1917.

DENTAL LEGISLATION

Amendment to the Connecticut Dental Law

PROVIDING FOR THE

Education and Examination of Dental Hygienists.

SUBSTITUTE FOR SENATE BILL NO. 170. WENT INTO EFFECT JULY 1, 1917.

[Chapter 269.]

AN ACT

PROVIDING FOR THE EDUCATION AND EXAMINATION OF DENTAL HYGIENISTS.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 12 of Chapter 316 of the Public Acts of 1915 is amended to read as follows:

Any registered or licensed dentist may employ women assistants who shall be known as dental hygienists. Such dental hygienists may remove calcareous deposits, accretions, and stains from the exposed surfaces of the teeth and directly beneath the free margins of the gums, but shall not perform any other operation on the teeth or mouth, or on any diseased tissues of the mouth. They may operate in the office of any registered or licensed dentist, or in any public or private institution under the general supervision of a registered or licensed dentist. The Dental Commission may revoke the license of any registered or licensed dentist who shall permit any dental hygienist operating under his supervision to perform any operation other than that permitted under the provisions of this section.

On or after July 1, 1917, no dental hygienist shall be permitted to practice who has not registered with the recorder of the Dental Commission, unless such person shall pass an examination prescribed by the Dental Commission. The fee for such examination shall be ten dollars. Any applicant failing to pass such examination shall be entitled to a reexamination at the next meeting of the Commissioners, without additional cost, and for any other additional examination a fee of five dollars shall be paid. The Dental Commission shall make such rules and regulations as may be necessary for the examination of dental hygienists. Said Commission may issue its certificate to any applicant therefor who shall furnish proof satisfactory to said Commission that she has been duly licensed to practice as a dental hygienist in another state after full compliance with the requirements of its dental laws, provided her professional education shall not be less than that required in this state. The Dental Commission may revoke the registration and license of any dental hygienist violating the provisions of this act.

DENTAL COLLEGE COMMENCEMENTS

North Pacific College.

THE annual commencement exercises of North Pacific Dental College were held on May 23, 1917, in Portland, Ore.

Addresses were delivered by Mr. Wm. D. Wheelwright and Dr. A. E. Rockey.

The degree of Doctor of Dental Medicine was conferred by Dr. Herbert C. Miller, president, on the following graduates:

Noel P. Akers	Illinois
Leroy Albright	Washington
Rowland L. Atcheson	Montana
Lyle A. Baldwin	Oregon
Allen T. Bates	Oregon
Nona P. Bennet	Oregon
Gordon A. Billings	Washington
William F. Bowman	Washington
Howard G. Bradbury	Washington
Hugh McC. Breckon	Oregon
Roy E. Briggs	Oregon
Philo G. Brown	Oregon
Vivian Z. Brown	Oregon
Ruric L. Burdic, Jr.	Oregon
Frank G. Burrell	Washington
Harold G. Carson	Canada
Charles J. Coultas	Canada
William M. Dale	Oregon
Louis A. Dillard	California
Melvin O. Egbert	Oregon
Elwood B. Faxon	Oregon
William A. Fergie	Canada
Clinton T. Fleetwood	Washington
Josiah D. L. Fletcher	Canada
George G. Forbes	Oregon
George E. Gaynor	Washington
Howard I. Gilbert	Washington
Robert R. Glen	Washington
Edward W. Gourley	Washington
Philip J. Graef	Oregon
Arthur W. Hager	Oregon
Arthur W. Hahn	Washington
Robert E. Hampson	Washington
Frank S. Heer	Idaho
John G. Hobson	Canada
Henry L. Holter	Washington
Walter R. Hooper	Washington
Aubrey Humphries	New Zealand
George H. Johnson	Montana
Toiva S. Johnson	Oregon
William H. Keller	Canada
Koudo M. Katsu	Japan
Joseph A. Kurlander	Ohio
Albert E. Lawrence	Canada
Arthur B. Leininger	Oregon
Cecil F. Lindley	Oregon
Ronald A. McAllister	Canada
Robert C. McCarter	Canada
Samuel B. McClintock	Canada
Angus McInnes	Canada
Roy M. Mellor	Canada
Leslie V. Merrill, Ph.G.	Idaho
Solomon Miller, Ph.G., LL.B.	Oregon
Henry W. Minton	Missouri
Harold F. Mitchell	Canada
Edwin Morene	Oregon
Frank C. Morse	Washington
John L. Mulder	Washington
Lester L. Murphy	Oregon
Marguerite M. Murphy	Washington
Olaf T. Olsen	Washington
Robert E. Ostermann	Oregon
Russell R. Owens	Washington
Janfred Parpala	Oregon
Arnold Pedersen	Washington
John E. Pedersen	Washington
Willard Arthur Peterson	Washington
Lawrence F. Pickens	Oregon
Edward H. Prehn	Oregon
Frank V. Prime	Oregon
Lonnie E. Roberg	Washington
Lawrence A. Rosenthal	Oregon
Alfred Schilt	Oregon
Joseph T. Shimek	Washington
Chr. Slamberg	Idaho
Reiba L. Smith	Idaho
Walter K. Sproule	Canada
William L. Stansbury	Oregon
William R. Stokes	Canada
Merlin R. Stolts	Washington
Wallace Sundborg	Washington
Michael C. Sult	Oregon
William S. Thompson	Oregon
Harry W. Titus	Oregon
James W. Wabraushek	Washington
Donald A. Walker	Oregon
Frank H. Weeks	Utah
Francis S. Weir	Washington
Errol W. Willett	Oregon
Oscar F. Willing	Oregon
Lawrence R. Wilson	Washington
Albert DeF. Woodmansee	Oregon
Guy A. Woods, A.B.	Oregon

Chicago College of Dental Surgery.

The thirty-fifth annual commencement exercises of Chicago College of Dental Surgery were held in Chicago, Ill., on May 29, 1917.

Addresses were delivered by John M. Coulter, Ph.D., and John P. Buckley, Ph.G., D.D.S.

The degree of Doctor of Dental Surgery was conferred by Truman W. Brophy, M.D., D.D.S., Sc.D., LL.D., dean of the faculty, on the following graduates:

T. R. Allen	North Dakota
Bernard Altman	Wisconsin
E. R. Anderson	Wisconsin
O. V. Anderson	Michigan
James E. App	Illinois
S. E. Axelrod	Illinois
K. Bahadour	Illinois
C. E. Bancherel	Illinois
P. Beguian	Illinois
L. Berensen	Illinois
M. Bethea	Alabama
C. D. Beveridge	Montana
E. O. Billings	South Dakota
Dave Bogaard	Iowa
H. D. Brockbank	Utah
Minnie Budka	Illinois
J. H. Cannon	Illinois
R. J. Capel	Illinois
J. E. Carlson	Illinois
C. H. Carpenter	South Dakota
J. A. Carriss	Canada
Geo. Cassidy	Massachusetts
R. Clements	Illinois
S. Colom	Porto Rico
H. D. Coltman	Illinois
J. C. Day	Iowa
M. B. Deutsch	Illinois
S. R. Deutsch	Illinois
G. R. Doxey	Utah
S. J. Draper	Indiana
W. M. Duncan	Canada
R. Fernandez	Porto Rico
V. H. Fuqua	Illinois
W. J. Furie	Illinois
C. M. Garcia	Porto Rico
Mrs. M. Gee	Utah
S. J. Ginsburg	Illinois
H. Greenberg	New York
I. Greenspahn	Illinois
G. M. Goldstein	Illinois
S. B. Goodney	Michigan
H. A. Grossman	Illinois
C. R. Gudmunsen	Idaho
L. O. Halgren	Utah
J. R. Hayward	Wisconsin
R. A. Heller	Illinois
H. M. Henderson	Illinois
F. J. Henkel	Illinois
U. Hernandez	Porto Rico
F. G. Hess	Minnesota
C. G. Hitt	Ohio
W. J. Imber	Illinois
E. B. Irwin	West Virginia
B. Izakowitch	Illinois
H. F. Jahnke	Illinois
M. Jensen	Michigan
G. G. Johnson	Illinois
W. W. Johnson	Illinois
A. Jumer	Minnesota
Harry Kahn	Illinois
G. Kasalovsky	Illinois
W. S. Kelly	Illinois
Robert Kenel	Illinois
J. L. Kennedy,	Illinois
K. S. Khedroo	Illinois
F. Kimmel	Illinois
H. Kirmse	Wisconsin
H. R. Klaudt	South Dakota
J. Kobrzynski	Illinois
M. J. Krogen	Illinois
W. F. Lane	Illinois
H. P. Langworthy	Wisconsin
R. W. Lee	Illinois
R. H. Leggett	Illinois
M. K. Lepak	Minnesota
P. Lieber	Illinois
J. Liebers	Illinois
J. J. Liss	Illinois
F. Luscher	Illinois
H. L. Macdonald	Wisconsin
S. A. Mackenzie	Michigan
G. A. McConnachie	Illinois
H. L. McCulloch	Illinois
F. H. McCullough	North Dakota
H. J. McKean	Pennsylvania
R. W. McKell	Utah
C. V. McKinley	Illinois
R. W. McLean	Illinois
Louis Manilow	Illinois
W. W. Merrill	Utah
F. Meyers	Illinois
L. M. Mikulas	Iowa
G. W. Mikulas	Iowa
R. Miller	Indiana
L. G. Mullineux	Illinois
A. Musaph	Illinois
W. G. Neilson	Canada
E. G. Nelson	Michigan
G. W. Nelson	Wisconsin
M. O. Nelson	South Dakota
E. M. Overholt	Pennsylvania
C. Papantonopolos	Greece
E. A. Paxman	Utah
B. M. Pisha	Illinois
J. A. Pope	Texas
D. W. Rainey	Utah
Otto Reithel	Michigan
C. M. Rile	Nebraska
E. F. Ringlee	North Dakota
R. A. Ross	Wisconsin
E. W. Sandquist	Sweden
A. Saskor	Austria
H. W. Schneider	Wisconsin
Minnie Schnitzer	Illinois

S. Schroeder	Illinois
B. J. Schuhman	Wisconsin
S. U. Schuhman	Illinois
M. C. Serles	Illinois
L. Shaughnessy	Illinois
H. A. Single	Illinois
S. Sinkler	Illinois
D. L. Sloane	Illinois
H. C. Sorenson	Norway
L. M. Stern	Illinois
J. A. Stone	Illinois
W. Strozewski	Illinois
A. Tamarin	Pennsylvania
F. R. Tanner	Illinois
A. O. Torson	Wisconsin
J. W. Tretner	Washington
C. L. Tyler	Wisconsin
G. Vennesland	Illinois
L. N. Vickers	Canada
A. H. Volkman	Illinois
E. R. Voss	Illinois
C. O. de Vries	Illinois
J. W. Weidner	Illinois
I. A. White	Illinois
M. Wilcox	Utah
E. V. Wirth	Montana
C. Witous	Illinois
J. Yasaki	Illinois
S. C. Young	Illinois
L. Zuback	Illinois

McGill University, Dental Department.

At the annual convocation of McGill University, held in Montreal, Can., on May 11, 1917, the degree of Doctor of Dental Science was conferred on the following graduates:

Frederick D. Derrick	Quebec
Ellis J. Jarjour	Quebec
Daniel P. Mowry	Quebec
Axel T. Oberg	Quebec
Hyman H. Pearson	Quebec
Jack Rosen	Quebec
Louis Schacter	Quebec

Southern Dental College.

The annual commencement exercises of Southern Dental College were held in Atlanta, Ga., on May 31, 1917.

The annual address was delivered by Dr. D. D. Atkinson.

The degree of Doctor of Dental Surgery was conferred by Hon. Edmund W. Martin, first vice-president, board of trustees, on the following graduates:

Spencer R. Atkinson, Jr.	Georgia
A. Pitt Beam	North Carolina
Edgar P. Bellefontaine	Massachusetts
James S. Belk	South Carolina
I. O. Bishop, Jr.	Florida
Gaston G. Booker	Alabama
Richard A. Brown	Florida
Jesse E. Brunson	Florida
Herman W. Cook	Georgia
Rosaire J. Couillard	Massachusetts
Robert T. Douglas	South Carolina
Marvin M. Ellis	Georgia
Henry G. Fain	Georgia
James B. Gaines	South Carolina
Charles F. Gleeson	Georgia
Ernest S. Hamilton	North Carolina
S. Vance Hunter	Georgia
George C. Kirkley	Georgia
James Ira Lawson	North Carolina
L. J. Lyle	Mississippi
Charles W. McAnally	Virginia
James R. McCree	Georgia
Chas H. McKenzie	Alabama
George W. Mattox	Georgia
Vaughn L. Maxwell	Alabama
Gerald A. Mitchell	Georgia
David O. Montgomery	North Carolina
Carl M. Murray	Mississippi
Howard P. Neal	Georgia
William M. Newton	North Carolina
Thomas M. Page	Georgia
Olin G. Pinkston	Alabama
Romulus D. Pittman	Mississippi
Ernest A. Ray	Mississippi
Francisco M. Salerno	Connecticut
Orvis D. Sanders	Alabama
Lee V. Sexton	Kentucky
Elza O. Shipman	Alabama
Albert E. Staley	Virginia
John W. Stegar	Kentucky
David M. Steinhofer	Cuba
Charles C. Tinsley	Georgia
I. Bert Trafford, Jr.	Alabama
Marcus L. Troutman	North Carolina
W. Chester Wall	Florida
Thomas C. White	Kentucky
Edward S. Williams	Louisiana
George L. Williams	South Carolina
Farris H. Wilson	Georgia
Tiffany Wilson	North Carolina

The Thomas W. Evans Museum and Dental Institute School of Dentistry University of Pennsylvania.

The annual commencement exercises of the Thomas W. Evans Museum and Dental Institute School of Dentistry University of Pennsylvania were held on Wednesday, June 20, 1917, in the Metropolitan Opera House, Philadelphia, Pa.

An oration was delivered by the president, Chas. F. Thwing.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

James E. Aiguier
Charles G. Algase
John J. Allison
Julius Altman
William J. Asprey
Stanley H. Baldwin
Carlisle C. Bastian
Maurice S. Baumgarten
Myer Baylinson
Robert B. Beachler
DeForest Becker
Edward A. Beddoe
John H. Bender
Elmer M. Benson
Leslie S. Blakeman
Leonard S. Blumberg
Robert S. Bordner
Jessica L. Bozorth
Leigh H. Breisch
Thomas L. Briggs, Jr.
Ernest N. Brown
George C. Brown
Hugh R. Burns
Alfredo J. Byrne
Joseph F. Byrnes
Charles Cadwallader
Vincent D. Callahan
Harry C. Campbell
John B. Campbell
Horace G. Clark
Raymond K. Clark
Warren H. Collie
Arthur E. Corby
Edwin R. Cornish
W. J. Coverley-Smith
Frank A. Crane
Francis J. Cullen
Francis C. Cunning
Waldo R. Currie
Paul R. Daugherty
William T. Davidson
Harry W. Deegan
Robert A. DeWitt
Manuel M. Diaz
Francis E. Donnelly
Harry W. Donovan
John L. Dowd, Jr.
Walter B. Dundon
Frank J. Dunn
Frederick C. Ehrle
Frank J. Ernst
David H. Evans
Charles P. M. A. Even
George R. Fagan
Edward Favero
Albert G. Federman
Richard S. Fielding
Herbert L. Fischer
Henry R. Fischwenger
Morris B. S. Fleischer
Eugene Foley
Edward E. Forman
Jules Frankel
Albert T. Fricke, Jr.
Edgar V. Friend
Gonzalo J. Gallegos
Robert N. Gardiner
Albert L. Geisenhoner
Chalmer L. George
Domingo P. Giammattei
Walter S. Gingenbach
Philip J. Gorman
Frank R. Gould
Roland G. Gould
James L. Gray
Robert G. Gray
John H. Greene
Timothy J. Griffin
Theodore H. Grimm
Arthur W. Guilfoyle
Arthur H. Hadley
John H. Hall
Wilfred Hall
Guy L. Haman
Beecher F. Hammond
William W. Harley
Leon H. Harris
Manville S. Harris
George T. Harter
José T. H. Mejía
Charles C. Henderson
John J. Heverin, Jr.
Hans C. F. Hille
Francis R. Hittinger
Chester A. Hochstrasser
Burton L. Hodgkins
Herbert McD. Hogue
William V. Holzman
Carl F. Howe
William C. Hudson
Russell B. Hurff
George A. Hussey, Jr.
Carl D. Hutchinson
Edward A. Hyland
William H. Hynard
Hernando Ibanez
Manuel A. Iguina
Wesley L. T. Jackson
Francis T. Jamison
Clarence E. Johnson
Frederick H. Johnson
Edward F. Jones
Samuel Kalison
Myer M. Kane
Raymond Keenholts
George M. Kelly
Warren H. Kent
John W. Kistler
George D. Klie
Jacob E. Klund
Abraham Knebelman
Arthur S. Koob
Michael Krall
George H. Kuhlmann
Gamshei Kutikoff
Philip J. Landry
C. Lloyd Lindemuth
Edgar W. Lindsay
Edward C. Looney
José R. L. Jauregui
Harry B. Lorenz
Leonard E. Loveridge
Thomas W. Lumis
Benjamin Luntz
William R. Lutz
Paul J. McCarthy
Eugene A. McCloskey
Frank T. McGuire
David P. McQuillan, Jr.
Thomas P. McWilliams
William L. MacDonnell
Sumner W. Mackie, Jr.
Arthur S. Macmillan
Morris T. Mann
Irving Marguiles
Glenn H. Markham
Louis Marks
Thomas J. Matera
Howard K. Mathews
George B. Monroe
Charles A. Moody
Allie G. Morgan
Robert E. Mulholland
William G. Murray
William R. Myskens
Jane Nathan
Louis M. Nelson
Augustave Neuber, Jr.
Maurice Newton
Samuel Novack
Philip S. O'Brien
Elmer E. Odell
Clarence E. Parlow
Frederick T. Pasch
Charles F. Philips
Julius L. Porias
Roger W. Potter
Moe M. Radin
John P. Reading
Morris Rich
Abram Robinson
Leo W. Roohan
Bernard L. Rosenstengel
Eli B. Rosser
Benjamin Roth
Max Ruttenberg
Edward D. Scanlan
Esther Schupack
Moses Schwartz
Lawrence C. Scudder
Oliver A. Shanahan
Philip L. Shapiro
Herman Sharpe
Robert M. Shaw
Lawrence W. Silverman
Stanley E. Slocum
Jacob Solomon
James N. Stanio
Roy C. Starr
Rodger C. Strickhouser
Frank A. L. Sturridge
Joseph J. Sullivan
John E. Sweeney
Adam W. Swigler
Henry K. Taylor
Henry A. Thiede
Charles A. Tiley
Frederick M. Tompkins
Julio A. T. Hernandez
Carl E. Trebing, Jr.
Francis de Sales Tucker
William V. Vickers
Fred D. Vreeland
Herman L. Wagner
Alfe G. Wald
Ray J. Walkerman
George E. Warren
George P. Warren
Harry Wartel
Howard C. Watson
Simon S. Weisman
Sperry G. Wheeler
Louis Witz
Maurice B. Yoder
Harry L. Zeve
David E. Zimmerman

Tufts Dental College.

At the annual commencement exercises of Tufts Dental College, held in Boston, Mass., on June 18, 1917, the degree of Doctor of Dental Medicine was conferred on the following graduates:

Emory C. Bardwell	Massachusetts
Robert H. Barnard	New Hampshire
Anthony Barone	Massachusetts
George F. Bearse	Massachusetts
H. J. Bennett	Massachusetts
Bernard Berg	Massachusetts
Harlan F. Besse	New Hampshire
Helen A. M. Bixby	Massachusetts
Israel M. Blumerfield	Massachusetts
Bernard N. Cantor	Massachusetts
Thurston E. Carr	Massachusetts
Frank L. Chase	Maine
Marion J. Cobb	Massachusetts
Albert G. Coffey	New Hampshire
William T. Coggar	New Brunswick
Harry C. Collier	Massachusetts
John F. Commins	New Brunswick
Llewellyn L. Crites	Maine
Paisley S. Crowe	Massachusetts
Laura B. Deane	Massachusetts
Henry R. Delaney	Massachusetts
Frederick J. Desmond	Massachusetts
Ralph J. Devoe	Vermont
John G. T. Dick	Massachusetts
Meriel L. Dimmick	Massachusetts
Arthur Dixon, M.D.	Massachusetts
Theodore P. Donahoe	Massachusetts
William F. Donahoe	Massachusetts
Arthur T. Ellison	Massachusetts
O. E. Fernald	New Hampshire
Wendell P. Ford	Massachusetts
Alice S. Foster	Massachusetts
Merwin K. Fox	Massachusetts
Eugene L. Frechette	Massachusetts
Emile R. Fredette	Massachusetts
Albert E. French	Maine
Frank Fuller, Jr.	Massachusetts
Stanley R. Garrard	Massachusetts
Samuel Goldman	Massachusetts
Edward C. Goodell	Massachusetts
John G. Goodridge	Massachusetts
Ernest M. Gould	Massachusetts
Richard J. Grigg	Massachusetts
Philip C. Gutterson	Vermont
Stanley E. Hall	Massachusetts
Irving R. Hardy	Massachusetts
Clarence W. Harrigan	Maine
Joseph G. Harrington	New Brunswick
Harry A. Hart	Massachusetts
Timothy G. Healy	Massachusetts
Sydenham C. Henriques	Massachusetts
Edward A. Henry	Massachusetts
John P. Herlihy	Massachusetts
Walter I. Hird	Massachusetts
Martin J. Hoar	Massachusetts
Alfred L. Hooker	Massachusetts
Fred T. Jewett	Massachusetts
Harry C. Jones	Massachusetts
Anthony L. Kapochy	Pennsylvania
John F. Kearney	Massachusetts
Harold F. Kedian	Massachusetts
Charles W. Krasnoff	Massachusetts
John E. LaBonte	Massachusetts
Birney J. Lameri	Vermont
Maurice A. Litner	Massachusetts
Otis M. Littlefield	New Hampshire
Walter E. Lockwood	New Hampshire
Raymond A. Lundgren	Rhode Island
John MacNeily	Massachusetts
Willard E. Martin	Massachusetts
John J. McCann	Massachusetts
William H. McCue	Massachusetts
Harry Mandelbaum	New York
Benjamin Mechaber	Massachusetts
William A. Milliken	Massachusetts
Anna Mintz	Massachusetts
William E. Moore	New York
Carlton B. Morse	Massachusetts
Myron C. Morse	Massachusetts
R. F. Mulcahy	Massachusetts
H. F. Murphy	Massachusetts
John R. Murphy	Massachusetts
Phillip I. Murray	Massachusetts
T. E. O'Hara	Massachusetts
Lauriston E. Orr	Maine
Richard C. Owen	Maine
Arthur T. Palmer	Massachusetts
Ray H. Palmer	Massachusetts
Clarence E. Parker	Massachusetts
David Porter	Massachusetts
Alec Prizer	Massachusetts
Fred G. Rollins	Massachusetts
Edw. Rosenberg	Massachusetts
Willis A. Rosenbloom	Massachusetts
Everett H. Ruggles	Massachusetts
Edward F. Ryan	Massachusetts
Edward M. Ryan	Massachusetts
John T. Saunders	Massachusetts
Robert N. Sawyer	New Hampshire
James B. Scanlan	Rhode Island
George A. Schlichte	Massachusetts
Samuel Segal	Massachusetts
John C. Seidel	Maine
Miriam Shapiro	New York
Michael J. Shea	Massachusetts
Edwin Sleeper	Massachusetts
Abraham G. Smith	Massachusetts
George R. Smith	Massachusetts
Herman N. Smith	Massachusetts
Isidore W. Smith	Massachusetts
Stephen L. Speight	Massachusetts
Bernard F. Staples	Maine
Louis Sternberg	Massachusetts
Donald G. Stewart	Canada
Edward F. Sullivan	Massachusetts
Alton H. Swett	Maine
Clarence M. Taft	New Hampshire
Wilfred V. Theriault	Massachusetts
Ralph J. Thompson	New Hampshire
Harold S. Whitney	Massachusetts
Robert P. Wildes	Maine
Arthur F. Williams	Massachusetts
Arthur C. Wilson	Massachusetts
Hammon L. Wollison	Massachusetts

Northwestern University, Dental Department.

The fifty-ninth annual commencement exercises of Northwestern University were held in Evanston, Ill., on June 13, 1917.

An address was delivered by Wm. R. Riddell, M.A., LL.D., F.R.S.C.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Edwin A. Alexander	California
George A. Allen	Illinois
Alfred G. Anderson	Illinois
Chester E. Ball	Nebraska
Lloyd W. Bevard	Illinois
John E. Birtwistle	Illinois
Merle T. Black	Nebraska
Samuel L. Blaustein	Illinois
Arthur F. Bokman	Illinois
Herbert L. Boman	Illinois
Minter K. Bragg	Missouri
Roland C. Bromund	Minnesota
Reid R. Bronson	Illinois
Otto Burri	Illinois
Fabius M. Butler	Missouri
Frank G. Canine	Utah
Jacob F. Cart	Wisconsin
Otto T. Cart	Illinois
Elmer H. Chapek	Illinois
Alan V. Cole	Canada
Louise O. Cole	Canada
Jeffie H. Dufner	Texas
Marcus M. Dunsworth	Canada
Raymond W. Ellis	South Dakota
Winfrey W. English	Missouri
Arthur R. Ezard	Canada
John A. Feaman	Illinois
Samuel S. Ferdinand	Illinois
Ralph W. Fisher	Illinois
Robert S. Freudenberg	Illinois
Benjamin T. Friedman	Illinois
Allan W. Garvey	Minnesota
Oscar E. Gilbertson	Illinois
Joseph F. Gillmeister	Illinois
Isadore S. Gollin	Illinois
Leif F. Graven	Wisconsin
Joseph W. Gray	Ohio
Edward B. Gurney	Illinois
Isaac LeR. Halterman	Missouri
James W. Hamilton	North Dakota
Thomas E. Hand	Alabama
T. Fred Hardy	Utah
Gustav Heineke	Texas
William J. Henry	Alabama
Paul A. Hielscher	Germany
Sue Kong Ho	Hawaii
Theodore A. Holland	Illinois
Harold A. Holm	Illinois
Harold A. Hooper	Michigan
Harry C. Howell	Illinois
Roderick G. H. Hurton	Canada
Harvey S. Huxtable	Wisconsin
Gustaf W. Johnson	Michigan
Robert V. Johnson	Illinois
Sam T. Jonas	Utah
Delmer R. Joyce	Minnesota
A. Sol Kabiller	Illinois
Ione J. Kakac	Illinois
Albert C. Kean	Michigan
Leo A. Kieren	Iowa
Henry W. Kirby	Illinois
Samuel M. Koppel	Illinois
John A. F. Kroschell	Texas
Hugo O. Lager	Illinois
Morton N. Lambert	Illinois
Howard P. Landry	Illinois
Otto H. Lawrence	Maine
Richard H. Layng	Canada
Abraham E. Lebowitz	Illinois
Willis H. Lovitt	Illinois
Gottfred R. Lundquist	Illinois
Harris W. McClain	South Dakota
Edward R. McKay	Canada
Angus J. McLaughlin	Minnesota
Homer N. Magnuson	Minnesota
Hosea J. Maricle	Minnesota
Clarence E. Matteson	Illinois
Lewis R. May	Illinois
Louis D. Metz	Illinois
Irvin A. Meyers	Wisconsin
Charles Miller	Illinois
Clyde J. Miller	Illinois
Francis J. Newton	Illinois
Páll J. Olafsson	Iceland
Abram J. Pearlman	Indiana
Ray G. Pierce	New York
Leonard B. Pitts	Illinois
Isaac S. Pomerance	Russia
Clarence E. Proctor	Illinois
Richard N. Rasmus	Illinois
Preston W. Reichman	Minnesota
Frank B. Rhobotham	Indiana
Joseph J. Rohner	Iowa
Peter J. Rose	North Dakota
Arthur G. Sanderson	Australia
Samuel E. Sanders	Iowa
Louis C. Shultz	Wisconsin
Perry L. Scofield	South Dakota
Robert F. W. Senick	Illinois
Mark H. Shideler	Indiana
Zenzo Shimomura	Japan
Presley W. Shriver	Iowa
Orr H. Sloan	Canada
Clifford G. Smelser	Minnesota
Elden J. Smith	Wisconsin
Truman F. Smith	Wisconsin
Alfred R. Sorbel	South Dakota
George H. Stansbury	Wisconsin
Elmer J. Stephen	Illinois
Morris B. Sternberg	Russia
George N. Sundquist	Wisconsin
Erwin E. Sweet	Michigan
Leonard B. Szafranski	Illinois
Joseph D. Talbot	Illinois
Reed F. Thornton	Michigan
Arlo W. Thorsness	Wisconsin

Clifford M. Toraason	Wisconsin
Palmer C. Trulson	Illinois
Mariano Valenzuela	Costa Rica
William M. Wagner	Illinois
Leonard P. Wahl	Wisconsin
Otis J. Wall	Minnesota
Emmett R. Watts	Iowa
Lester D. Weeks	Illinois
Herman R. Wenger	Illinois
Adrian F. Werner	Minnesota
Mary H. Westfall	Iowa
Evert L. White	Canada
Daniel W. Wilson	Minnesota
James S. Wright	Texas
Edward J. Wrobleski	Ohio
Edward A. Zimmerman	Illinois

Dalhousie University.

At the commencement exercises of Dalhousie University, held May 10, 1917, in Halifax, N. S., the following students were graduated in dentistry:

Reginald C. Crosby	Nova Scotia
Harold V. Ferguson	Nova Scotia

Royal College of Dental Surgeons.

At a special session of the Royal College of Dental Surgeons, held in the summer of 1916, in Toronto, Ont., the degree of Licentiate of Dental Surgery was conferred on the following graduates:

William W. Astle
Frank Bechely
Ariel E. Benson
Roy W. Blackwell
Robert M. Box
John D. Brown
Joseph W. E. Brown
Alvan E. Cavanagh
William Chartrand
John W. Coates
Charles R. Collard
Heber L. Coursier
Arthur L. Crozier
Lewis R. Davison
Franklin M. Deans
James E. E. Dores
Eldon W. Eby
Wallace R. Elgie
Harold G. French
Colwell C. Graham
Milton H. Hagey
Oliver Hart
Russell W. Hoffman
Harry M. Katzenmeir
Robert R. Larmour
George A. Lee
Clarence H. Lipsey
William A. Loveridge
William C. MacLachlan
Cyril F. McCartney
Roy A. McCormack
Kenneth McDowell
Harry L. McInally
R. V. McLaughlin
Ernest J. Oliver
Charles M. Porter
Melvyn G. Robb
William H. Scott
Richard A. Sheehy
William S. H. Sinclair
Harold E. Smith
Harry LeR. Smith
Leonard S. Smith
Lloyd R. Stedman
Ray J. Stone
Robert F. Taylor
John W. Turner
Robert D. Wallace
Erle F. Whaley
Albert G. Wicks
Ross H. Wing
Roy O. Winn
Russell C. Wood

At the regular commencement exercises, held in Toronto, in 1917, the Degree of Licentiate of Dental Surgery was conferred on the following graduates:

Henry H. Abell
J. A. C. Arbuckle
Archie B. Babcock
Laurier Ballantyne
William H. Barber
J. C. Barker
Frank E. Bell
Kenneth Berry
Michael G. Brick
Robert J. R. Bright
Joseph O. Brisebois
John C. W. Broom
John L. Burgess
Arthur W. G. Chambers
Roland M. Clark
Frank L. Cole
Andrew F. Colvin
David D. Cook
Clarence A. Coyne
Leo L. Crowley
Ralph L. Davis
Fred R. Drewry
Herbert L. Field
George V. Fisk
Vivian S. Fournier
Cecil H. Fulford
Francis J. Furlong
Roy A. Gilbert
Charles J. Haley
Harold H. Halloran
Michael J. Hooley
James W. Ingram
Thornton Ingram
Stewart McK. James
Frank S. Jarman
Charles L. Jones
William O. Kaufmann
Dillman L. Kinzie
Robert E. Laing
John T. Lebbetter
William C. Leggett
Henry D. Leuty
James B. W. Long
James O. McCutcheon
Cecil A. McDonald
Peter McIntyre
Lorne S. McLachlan
Hubert U. Maranda
Morris C. Mills
Marjorie E. Milne
Robert J. M. Montgomery
Harrison J. Mullett
Michael J. Mulvihill
Harold J. Murphy
Guy R. Murray
Allan Myles
Percy L. Nesbitt
Leo Parr
Lorne R. Pattison
Samuel Perlman
Stanley J. Phillips
J. Allan Plunkett
William A. Porter
Harvey W. Reid
James M. Reveler
Edgar J. Robb
Harrison C. Roos
John V. Ross
Joseph Ryan
Stanley V. Saunders
John M. Sheldon
Gerald M. Singleton
Herbert R. Stewart
Robert A. Strathern
Norman B. Temple
Lawrence Thompson
Morley A. Thompson
Jacob E. Truemner
Norman P. Truemner
Lloyd T. Veitch
Harold B. Walker
James G. White
Stanley G. White
Clair J. Wood
Daniel Young
Edward C. Young
William Young

NOTICES AND ANNOUNCEMENTS.

Preparedness League of American Dentists.

Headquarters—3 Professional Building, 131 Allen St., Buffalo, N. Y.

IMPORTANT NOTICE.

At a joint meeting of the Ad Interim Committee of the National Dental Association and the Advisory Committee of the Preparedness League of American Dentists, held in Buffalo, April 26, 1917, a resolution was passed establishing an Advisory Committee composed of the present Officers, Advisory Board, Board of Trustees, and the Ad Interim Committee of the National Dental Association. Action was taken confirming the permanent organization of the League as approved by the National Dental Association. It was also decided that the entrance fee to the League —$1.00—would continue in force.

ADVISORY COMMITTEE.

J. W. Beach	N. Y.	F. M. Casto	Ohio.	J. D. Millikin	Calif.
H. J. Burkhart	N. Y.	T. P. Hinman	Georgia.	A. W. Viney	Calif.
M. B. Eshleman	N. Y.	O. U. King	Indiana.	C. J. Lyon	Mich.
F. W. Low	N. Y.	T. W. Brophy	Illinois.	H. E. Friesell	Pa.
H. A. Pullen	N. Y.	W. H. G. Logan	Illinois.	E. C. Kirk	Pa.
H. L. Wheeler	N. Y.	G. N. West	Illinois.	J. V. Conzett	Iowa.
L. L. Barber	Ohio.	T. B. Hartzell	Minn.	B. H. Smith	Md.
S. D. Boak	Ohio.	T. W. Hergert	Wash	F. T. Murlless	Conn.
H. C. Brown	Ohio.	F. O. Hetrick	Kansas.	M. F. Finley	D. C.

The Preparedness League.

By J. W. Beach, *Chairman*, Buffalo, N. Y.

The Preparedness League of American Dentists has become the medium through which the dental profession at large is carrying on the work of preparation for the great service that is ahead of it. For a year and a half this organization has been putting forth every effort to awaken our profession to the realization of the situation, and had it not been for the unceasing labor of the organizers of the League surely we would have found ourselves in a deplorable state of unpreparedness when the stirring message that "War is upon us!" was sounded from coast to coast.

The League has nearly 6000 active members, and more than 125 sectional units in active operation. Study courses are planned for these units, and several lectures with slides are furnished free of charge. This has proved a most effective means of preparing hundreds of our members for the entrance examinations to the Officers' Reserve Corps, Dental Section. We are gratified to report satisfactory progress in securing a splendid Dental Reserve for our Government, and we predict the establishment of the most efficient service of any nation in this important department.

Caring for the mouths of applicants for enlistment who are unable to pay for dental service is a most important object of the League, and we wish to take this opportunity to thank our members for the unparalleled response which this phase of our work has received. We are proud of our profession, and when the final reckoning shall come it will be shown that we have saved to our country many thousands of fighters. The League has been designated the official medium for prosecuting this work, and members are requested to report to our headquarters all cases thus cared for, so that we may compile statistics to present to the Surgeon-general. The Government appreciates what we are doing, and we believe our efforts will not go unrewarded when future favorable legislation may be desired by us.

We hope to bring many new members into the National Dental Association through the League, and would call the attention of the officers of our units to this matter. We should bring many into the National before the annual meeting in October next.

The second annual meeting of the League will be held in conjunction with the National Dental Association on October 23, 1917, in Concert Hall, Hotel Astor, New York. We are planning a splendid program, and will be able to report wonderful results from the different units. Several dental ambulances for use in France are being supplied by our units, and other equally patriotic movements are under way.

We urge the formation of units more generally in order to promote the various objects of the League. Organization is essential, and we would point out that *now* is the time our best efforts are demanded, as the League is organized as a war measure; therefore we invite correspondence with this object in view. Headquarters are at 131 Allen st., Buffalo, N. Y.

INFORMATION RELATING TO APPOINTMENTS IN

THE DENTAL RESERVE CORPS OF THE ARMY.

THE National Defence Act of June 3, 1916, and the tentative regulations thereunder, provide for a dental section or branch of the Officers' Reserve Corps. The officers of the Dental Reserve Corps have the rank of first lieutenant, and are appointed and commissioned by the President, after having been found, upon examination prescribed by him, physically, mentally, and morally qualified to hold such commissions. Commissions are issued for periods of five years, at the end of which time the officers may be recommissioned, subject to such further examinations and qualifications as the President may prescribe. They are subject to call for duty in time of actual or threatened hostilities only. While on active duty under such call they are entitled to the pay and allowances (including quarters, fuel, and light) of their grade. They are entitled also to pension for disability incurred in the line of duty and while in active service. They are not entitled to pay or allowances except when in active service, nor to retirement or retired pay.

Appointees must be citizens of the United States, between TWENTY-ONE and FIFTY-FIVE years of age, must be graduates of standard dental colleges, and must, at the time of appointment, be in the active practice of their profession in the states in which they reside.

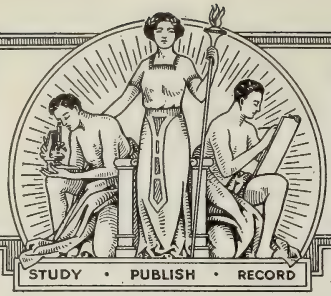
The examination is physical and professional. It is conducted by boards consisting in each case of one medical and two dental officers in the Army, designated by the War Department.

The examination as to physical qualifications conforms to the standard required of recruits for the United States Army. Defects of vision resulting from errors of refraction which are not excessive, and which may be entirely corrected by glasses, do not disqualify unless they are due to or are accompanied by organic disease. Minor physical deficiencies may be waived.

The professional examination will be oral. If the applicant fails therein, he may, if he desires, have a written examination. An average of 75 per cent. is required to qualify in the examination. The examination comprises the following subjects:

(1) Dental pathology and bacteriology.
(2) Chemistry, physics, and metallurgy.
(3) Recent advances in dental surgery and technique.

Applications for appointment in the Dental Reserve Corps must be made in writing, upon the prescribed blank form, to the Surgeon-general of the Army, Washington, D. C., who will supply the blank upon request. The correctness of the statements made in the application must be sworn to by the applicant before a notary public or other official authorized by law to administer oaths. It must be accompanied by testimonials based upon personal acquaintance from at least two reputable persons as to the applicant's citizenship, character, and habits, and by his personal history given in full upon the blank form furnished him for the purpose.



NATIONAL DENTAL ASSOCIATION ANNOUNCEMENTS

Twenty-first Annual Meeting, New York City, October 22-26, 1917.

To date the following reports have been received from the various section chairmen, committeemen, etc.

Partial Program.

SECTION I.

Chairman—Dr. E. D. Coolidge, 59 E. Madison st., Chicago, Ill.

"Some Neglected Operative Prerequisites." Dr. Fred E. Hart, San Francisco, Cal.

"Porcelain Inlays" (exact title not yet chosen). Dr. W. L. Fickes, Pittsburgh, Pa.

"Present Tendencies in Operative Dentistry." Dr. J. M. Walls, St. Paul, Minn.

Also an important paper dealing with the subject of Dental Education. (Essayist not selected as yet.)

SECTION II.

Chairman—Dr. F. B. Moorehead, People's Gas Bldg., Chicago, Ill.

Dr. Virgil Loeb of this committee reports that he has thus far accepted two essayists: Dr. Elmer S. Best, Minneapolis, Minn., on some phase of Root-canal Filling; and Dr. Howard R. Raper, Indianapolis, Ind., on "Misinterpretation of Radiographs."

SECTION III.

Chairman—Dr. L. E. Custer, 28 N. Ludlow st., Dayton, Ohio.

"Ionization, with Special Reference to Ionic Chemistry." Dr. Geo. T. Fette, Cincinnati, Ohio.

"The Chemical Action of Soil Bacteria on Calcium Phosphates, with the Chemical Analysis of the Human Teeth." Dr. J. E. Hinkins, Chicago, Ill.

"Why Measurements of the Mandible, Tracings of the Condyles, Construction of Hypothetical Triangles, and Use of the Face-bow, are All Non-essential to the Construction of Dentures Possessing the Highest Degree of Efficiency." Dr. D. D. Campbell, Kansas City, Mo.

(Subject to be announced later.) Dr. Calvin S. Case, Chicago, Ill.

Also two other papers, the titles of which will be announced later.

STATE SOCIETY OFFICERS' SECTION.

Chairman—Dr. John C. Forsyth, 430 E. State st., Trenton, N. J.

First session. "Some Phases of Postgraduate Work." Dr. B. L. Shobe, Tulsa, Okla.

"Securing Some Satisfactory Legislation." Dr. Alexander H. Reynolds, Philadelphia, Pa.

Second session. This will be devoted to six or seven short papers of five to ten minutes each by men of different state societies, telling of some outstanding feature of their own society's work that is thought to be of the greatest importance; or, if the essayist prefers, he may present the weak part of the work and ask for helpful suggestions. These papers are to be followed by a general discussion which it is hoped will bring out some very valuable points. (The essayists for this session have not as yet been secured.)

COMMITTEE ON ANESTHETICS.

The secretary of this committee, Dr. Chalmers J. Lyons, of Ann Arbor, Mich., reports as follows:

"The Teaching of Conductive Anesthesia." Dr. Theodor Blum, New York City.

"After-Pain in Local and General Anesthesia." Dr. A. E. Hertzler, Kansas City, Mo.

"The Toxicity of Local Anesthetics." Dr. Geo. B. Roth, Washington, D. C.

COMMITTEE ON ENTERTAINMENT.

At a recent meeting of this committee a Ladies' Auxiliary was organized, of which Mrs. Dr. M. L. Rhein was made chief officer, and Mrs. Dr. Henry W. Gillett, 140 W. 57th st., New York City, secretary. It would greatly facilitate the endeavors of the Ladies' Auxiliary to add as much as possible to the pleasures and comforts of the visiting ladies, if those who intend to come to New York would notify Mrs. Gillett stating, if possible, the hotel at which they will be registered.

Publicity Committee,
R. OTTOLENGUI, *Chairman.*

Railroad Rates.

THE Trunk lines and the New England and Central passenger associations have granted a rate of two cents per mile in each direction, going and returning via the same route only, limited to midnight of October 30th.

Going tickets in Trunk line territory will be on sale October 19th, 20th, 21st, at the one-way fares, on the certificate plan, these certificates to be indorsed by General Secretary Otto U. King, and to be validated by the special agent of the railroads, who will be in attendance on October 24th, 25th, 26th. Return tickets to be sold on presentation of validated certificates, October 24th to 29th, at the difference between the fares paid on the going trip and the fares for the round trip. Return limited to continuous passage to destination, and not later than October 30th. This applies on tickets with a minimum of $1.00 for round trip.

New England passenger association tickets to be sold or certificates issued and good going October 19th, 20th, and 21st and returning not later than October 30th. Two cents per mile each direction, shore line mileage, going and returning via the same route only.

Central passenger association territory round-trip tickets, requiring validation in New York City, will be sold on October 19th, 20th, and 21st, with a final return on October 30th. Two cents per mile in each direction.

There will be no fee for validation.

Committee on Transportation,
D. C. BACON, *Chairman.*

[NEW YORK CITY.]

National Association of Dental Faculties.

THE 1917 meeting of the National Association of Dental Facultes will be held at the Astor Hotel, New York City, Friday and Saturday, October 19 and 20, 1917.

The Executive Committee will meet at 9 A.M., and the general session will open at 10 o'clock as usual.

CHAS. CHANNING ALLEN, *Sec'y,*
N. W. cor. 10th and Troost, Kansas City, Mo.

[NEW YORK CITY.]

Xi Psi Phi Fraternity.

THE alumni of the Xi Psi Phi Fraternity will hold a dinner at the Waldorf-Astoria Hotel, New York City, on October 22, 1917.

All the alumni of the fraternity are most cordially invited to attend. For particulars write

J. NOHERT GELSON,
282 Park Place, Brooklyn, N. Y.

[NEW YORK CITY.]

Association of Military Dental Surgeons.

THE annual meeting of the Association of Military Dental Surgeons of the United States will be held at Hotel Astor, New York City, October 23 to 26, 1917.

J. D. MILLIKIN, *President,*
S. W. HUSSEY, *Sec'y.*

American Society of Orthodontists.

THE annual meeting of the American Society of Orthodontists will be held at Excelsior Springs Mo.—thirty minutes' ride from Kansas City—September 5, 6, 7, and 8, 1917.

The program will be one of the best ever presented by the society. All those interested in orthodontia are invited to attend.

F. M. CASTO, *Sec'y,*
Cleveland, Ohio.

Northeastern Dental Association.

THE twenty-third annual meeting of the Northeastern Dental Association will be held at the Bancroft Hotel, Worcester, Mass., on September 26, 27, and 28, 1917.

ALVIN A. HUNT, *Sec'y,*
Hartford, Conn.

National Mouth Hygiene Association.

Department of Extension Lectures.

A complete lecture set, consisting of full manuscript and thirty-six specially selected and prepared lantern slides covering the subject of Mouth Hygiene, is furnished by this association to members of state dental societies and others who may be considered as qualified to present the subject on the lecture platform.

For rental and sale terms and other particulars address the undersigned.

Edwin N. Kent,
Director of Extension Lectures,
330 Dartmouth st., Boston, Mass.

Forsyth Dental Infirmary for Children.

New Department—Library and Museum.

The trustees and director of the Forsyth Dental Infirmary for Children have authorized the creation of a new department, to be known as the "Library and Museum." They solicit from the dental profession contributions of books and dental periodicals, particularly those out of print and not readily obtainable by purchase; also specimens of dental abnormalties, casts, or specimens of unusual structures of dental interest, for all of which permanent acknowledgment will be given.

Frederick A. Keyes, D.M.D.,
Librarian and Curator of Museum.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING JUNE 1917.

June 5.

No. 1,228,488, to William F. Shaw. Crown attachment.

No. 1,228,617, to Axel E. Stigberg and Charles Bechtold. Die punch.

No. 1,228,620, to George W. Todd. Artificial tooth.

No. 1,228,667, to Alfred Gysi. Articulator.

No. 1,229,024, to Raymond V. Brandt. Dental instrument.

June 12.

No. 1,229,553, to Harry F. Waite. Dental film holder.

No. 1,229,595, to Ernest A. DuBrul. Cotton roll holder.

June 19.

No. 1,230,156, to Rudolph L. Hanau. Dental surveying apparatus.

No. 1,230,254, to Elmer E. Wightman. Casting machine.

No. 1,230,279, to Charles J. Coffey. Toothbrush.

No. 1,230,284, to Otto B. Elkins. Rubber dam holder and cutter.

No. 1,230,561, to Marshall S. Smith and Isidor Chige. Dental broach.

No. 1,230,683, to John A. Daly. Tooth-cleaning device.

June 26.

No. 1,230,852, to Rutherford H. Bowsher. Artificial tooth.

No. 1,230,853, to Rutherford H. Bowsher. Artificial tooth.

THE

DENTAL COSMOS

VOL. LIX. SEPTEMBER 1917. No. 9.

ORIGINAL COMMUNICATIONS

Pre-Columbian Operative Dentistry of the Indians of Middle and South America:

The First Record in History of the Inlay Procedure.

By BENE VAN RIPPEN, D.M.D., Cambridge, Mass.

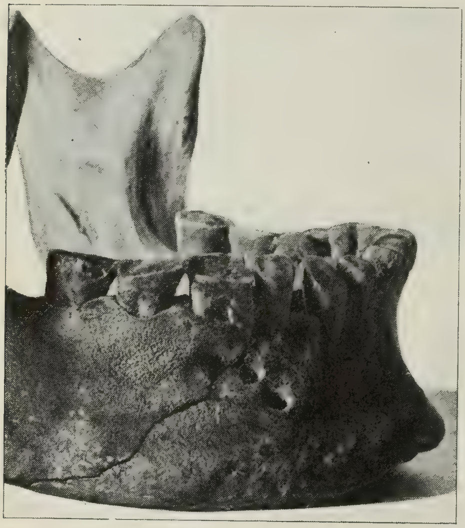
IN order to establish the claim expressed in the title of this article one is obliged to go back as far as historical knowledge permits, with the understanding that assumptions are not accepted as facts, nor are references to the subject allowed to pass as truths.

It is not my intention to attempt to prove by whom operative dentistry was first practiced as a science, but I shall try to establish the fact that the Mayas of Central America and the people of Ecuador were the first to prepare cavities in living teeth and insert inlays made to fit the cavities, without having any prophylactic measures in view. The leading authorities on old Egyptian medicine and mummies, and on Phenician, Greek, and Roman medicine and dentistry, were consulted, covering a period of over 2000 years, from 1550 B.C. to 500 A.D., without proving that the above contention is incorrect or unfounded.

That the Egyptians, even before the Ebers papyrus, practiced oral surgery, either actual or experimental, is proved by the mandible shown in Fig. 1.

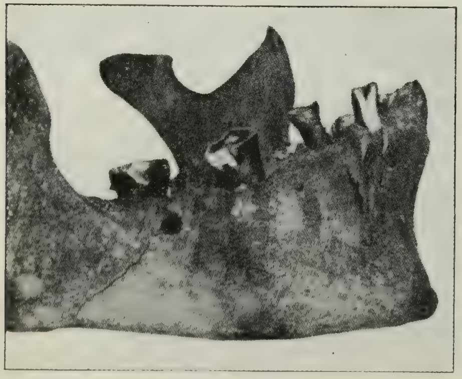
This jaw(1) belongs to the old Egyptian empire, about 2500 B.C. The teeth are much worn down, exposing the mesial root-canal of the right first molar. The most mesial of the three holes is the foramen mentalis, the two others being artificial fistulæ. Dr. Kurt H. Thoma of the Harvard Dental School made this important discovery; Dr. Hooten of the Peabody museum of Harvard University, however, did not think this probable. The mandible was shown to me by Dr. Hooten, and in order to prove Dr. Thoma's contention I suggested a refracture of the jaw in order to ascertain if an abscess cavity were present which necessitated the making of an artificial drainage. This was easily accomplished, the jaw having been glued together after a previous fracture, due probably to handling during excavation. After inserting the mandible in hot water the glue softened, and the two parts easily separated. A large abscess cavity, the size of a small marble, could be seen, and also a black spot on the mesio-buccal aspect of the posterior root.

Fig. 1.



This spot is on a perfectly straight line with the fistula, and is due no doubt to the instrument used. The circular depression seen around the posterior fistula gives one the impression that an instrument resembling in principle an auger might have been used. The question of whether this operation was performed during life or after death need not here be raised, although the absence of bone regeneration may tend to prove that either the person died soon after the operation was performed or that it was done after death as a matter of investigation. The former seems the more probable, however. Fig. 2 shows another case similar to the previous one.

Fig. 2.



Pre-dynastic mandible. (Peabody Museum.)

EGYPTIAN SURGERY RECORDED IN THE EBERS PAPYRUS.

The next important evidence with regard to this newly discovered Egyptian surgery is the Ebers papyrus(²) in the library of Leipzig University. There are other papyri in the universities of Berlin, Leyden, Turin, and Paris, but the one procured by Prof. George Ebers in 1873 from an inhabitant of Luxor in Upper Egypt is the most voluminous and best written of all. In this papyrus we find three dental prescriptions, and Ebers has proved these to have been in use about 1550 B.C. No reference can be found to any dental surgery or operative dentistry.

Herodotus(³) 500–424 B.C., about 1000 years after the Ebers papyrus was written, writes in his second book as follows:

> The exercise of medicine is regulated and divided among Egyptians in such a manner that special doctors are deputed to the curing of every kind of infirmities, and no doctor would ever lend himself to the treatment of different maladies.
>
> Thus Egypt(⁴) is quite full of doctors; those for the eyes, those for the head, some for the teeth, others for the belly, or for occult maladies.

It is very difficult to establish the limits of the activities of the dentists alluded to by Herodotus. It has been affirmed by some that dental art in Egypt was very far advanced, and that not only the application of artificial teeth and even of pivot teeth was practiced, but also that stoppings were made by the dentists of those days. Both filled and artificial teeth are found in mummies, and Dr. J. G. Van Marter(⁵), a dentist in Rome, in an article on prehistoric dentistry, writes among other things that the renowned archeologist, Mr. Forbes, had seen mummies' teeth stopped with gold.

Prisland(6), Wilkinson, and Forbes(7), all claim to have seen or found mummies' teeth stopped with gold. But where are these teeth preserved? Then, again, the evidence of the stoppings having been done by the Egyptians as dentists is unsatisfactory, as verification of the work having been performed before or after embalming(8) is not possible. Fraud is not excluded, and it has been reported that the supposed Egyptian stopping found in a mummy in an English museum was nothing but a practical joke and carried out crudely besides.(9)

LACK OF EVIDENCE OF DENTAL PRACTICE AMONG THE EGYPTIANS.

The celebrated Egyptologist(10), Prof. George Ebers, with the most accurate research, has arrived at completely negative results in all that has reference to the dental art of the ancient Egyptians. The distinguished craniologist, Prof. Emil Schmidt(11) of Leipzig, who owns a collection of several hundred mummy skulls, writes thus on the question now before us: "In no jaw have I ever found anything that could be attributed to the work of dentists: no fillings, no filing or trepanning of teeth, and no prosthesis." Virchow, who also examined a great many Egyptian skulls, among which were several belonging to royal mummies, did not find any indication of dental work; and Mummery, after making the most conscientious researches on this subject, could not arrive at any positive result whatever.

Considering, then, the failure of all these men to obtain positive proof regarding the practice of dental surgery among the Egyptians, we cannot but consider, until sufficient proof be furnished, the assertions regarding the practice of operative dentistry as absolutely without value. Yet although it cannot be shown that operative dentistry was practiced, it has been proved that prosthetic dentistry was known to the Phenicians. Dr. Gaillardot(12), a member of Dr. Renan's Phenician scientific mission, discovered among other things—"A part of the upper jaw of a woman with the canines and the four incisors united together with gold wire." This piece, discovered in one of the most ancient tombs of the necropolis, proves that dental art in Sidon was considerably advanced.

Hippocrates(13), 460 B.C., the founder of modern medicine, advises the extraction of teeth when decayed or loose, and cauterization if only painful. He describes the use of certain forceps and pincers for extraction. A mouthwash containing alum is recommended in case of gingivitis. He also recommended the binding of the teeth together in cases of fractured jaws. Hippocrates(14) makes no mention of prosthetic procedures in dentistry; filing of the teeth was unknown to him(15), although he mentions ulcers of the tongue being caused by the roughness of the teeth.

ANCIENT PRACTICE OF MEDICINE AMONG THE CHINESE.

The Chinese practiced the medicinal art in ancient days. Emperor Hwang-Te(16), 2700 B.C., is claimed to be the founder of Chinese medicine. In one of the most celebrated old medical books, Nuei-king, one may find remedies for nine varieties of toothache, and for seven different inflammatory conditions of the gums, including abscesses and tumors. No records in any form can be found to prove that operative dentistry was a part of the Chinese healing art. The natives of Hindustan(17) have practiced, and practice today, dental prosthesis to the extent of inserting an artificial or natural crown, tied with wire to the adjoining teeth, but its origin or antiquity has not been established. The Japanese(18) have for ages past substituted gold teeth for lost ones, and in Sumatra filing of the teeth was practiced by the natives to produce diastemæ, as well as to render the blackening of the teeth more effective, the exposed dentin absorbing and retaining the dye better. This custom prevailed also in Japan, but has in recent times disappeared. In Macassar(19) the natives dyed their teeth red, and also substituted lost teeth by artificial ones, made of gold and silver. Some of the negro races of Central Africa file their incisors to sharp points as a means of ornamentation as well as to make themselves appear more ferocious to travelers.

EXTENT OF THE PRACTICE OF DENTISTRY AMONG THE GREEKS, ROMANS, AND ETRUSCANS.

The Greeks worshiped Asklepios(²⁰) as their god of medicine. He is also said to be the first to extract a tooth, making him also the father of dental surgery. A lead instrument (*plumbum odontagogon*), used for extraction, was found in the temple of Apollo at Delphi, but the very nature of the metal used would indicate that no tooth could be extracted unless it was loose. Ætius(²¹), a Greek physician of Arabian birth 400–500 A.D., who studied at Alexandria, recommends filing of the teeth. He describes a file invented by himself for the purpose, having a rounded head in order to avoid lacerating the soft tissues.

Aristotle(²²) gives the number of teeth in man and animals, saying that a man has more teeth than a woman, and ascribes the elongation of a tooth without an antagonist to the growth of the tooth in question. In this misconception many followed him, Galen not excepted.

The Etruscans(²³), 700 B.C., had their dental art, no doubt acquired from the Egyptians and Phenicians. The dental appliances found in Etruscan tombs are an improvement upon any in use up to that time, being a series of gold bands soldered together, some to go around the sound teeth, the remaining bands carrying the artificial crown, which was generally carved from an ox tooth, it being a sacrilege to use human teeth.

The Romans(²⁴) received the idea of medical art from the Greeks. It appears that dentistry had begun to be practiced before their arrival, as can be proved in the law of the Twelve Tables, 450 B.C., where mention is made of teeth bound with gold. Dentifrices were greatly used, and all sorts of medicines were used to relieve toothache. They used gold toothpicks, several being found in France and one in Switzerland in the ancient seat of a Roman military colony. Prosthesis was highly developed, and gold shell crowns were used which were soldered to gold bands fitting around the adjoining teeth. Counter-irritants and cauterization are recommended by Archigenes(²⁵), as also the cleaning of carious cavities before applying a remedy. When a tooth appeared discolored he perforated the tooth with a small trephine invented by himself for the purpose. Galen(²⁶), 150 A.D., filed the teeth at the incisal edge after elongation, but did not favor extraction. Celius Aurelianus(²⁷), 300 A.D., advises rest when suffering from a toothache, and prescribes mouthwashes. Adamantius, an Alexandrian philosopher and physician, recommends dietetics, and forbids wine to those who are ill. Marcellus(²⁸), who practiced in Rome after Celsus, discouraged tooth extraction when having severe toothache, and prescribed cauterizing with boiling oil, also fomentations of opium and hyoscyamus. He mentions removing caries in teeth with a scalpel, and filling the cavity with a gum or like material.

He also advised the filling of a tooth with lead, not to prevent further decay but to insure a more successful extraction, the lead preventing the crumbling of the crown.

In the foregoing *résumé* a period of 3000 years has been covered, beginning with the Egyptian oral surgery and ending with Ætius, 400–500 A.D. One could continue and collect more data than this, but that is unnecessary, as we wish to consider particularly an American period, 200–600 A.D. From the foregoing records we are forced to the conclusion that no operative dentistry has been practiced except—

(1) The newly discovered Egyptian dental or oral surgery.

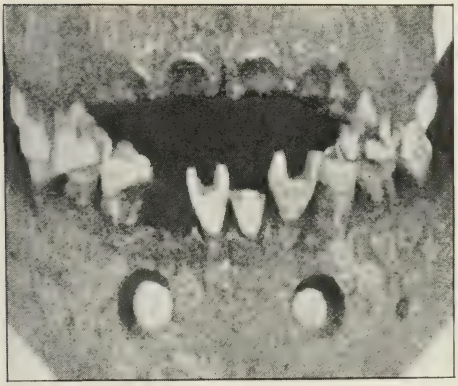
(2) Archigenes: Recommending perforation of a tooth when discolored.

(3) Galen: Filing of the teeth when elongated.

(4) Asklepios and others: Extractions.

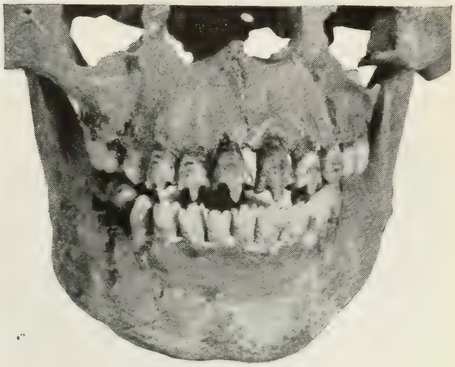
No proof has been established that the ancients used any substances for filling teeth(²⁹), and Laforgue had nothing whereupon he could base his assertion that such substances were known to many of the insular colonies of the Pacific ocean, among the savages of Canada and the Bedouins of Africa.

FIG. 3.



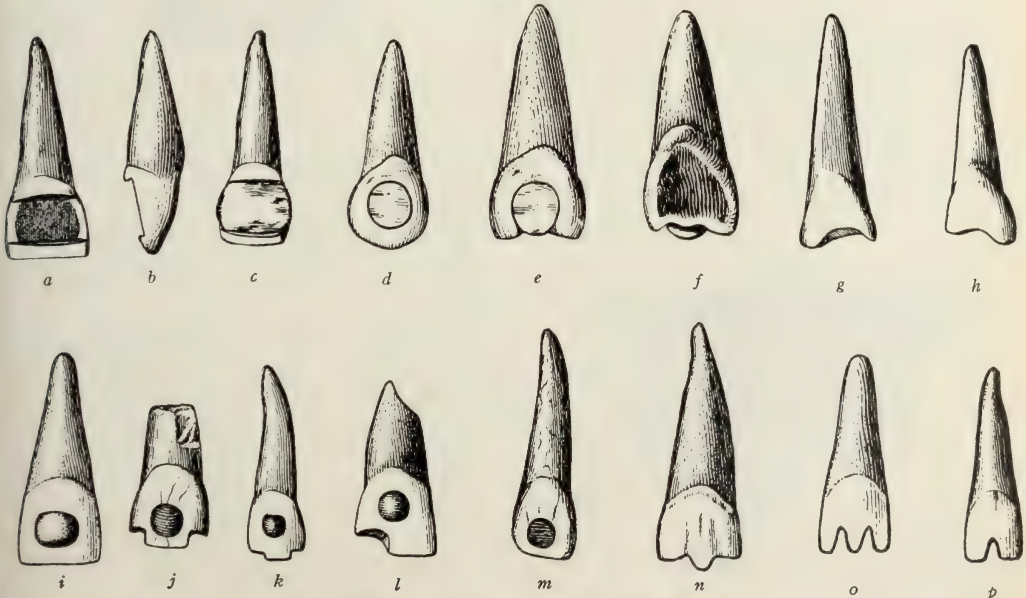
Dental mutilation; from Sayata, Argentina.

FIG. 4.



Skull with filed upper and lower incisors. (Peabody Museum.)

FIG. 5.



Decorated teeth, showing overlay, inlay, and filing.

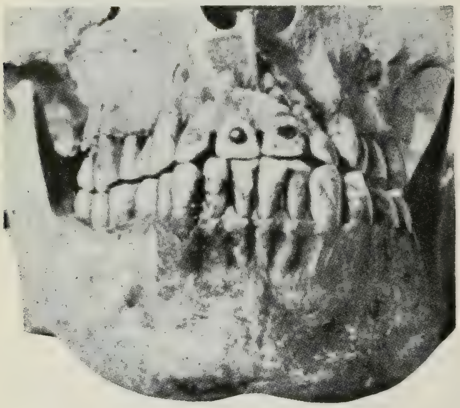
OPERATIVE DENTISTRY FIRST PRACTICED IN CENTRAL AND SOUTH AMERICA.

It is proposed now to shift the scene to Central and South America, and endeavor to prove that the peoples of these several countries and cultures are the ones who were the first in history to practice operative dentistry, and in particular the preparation of cavities for the insertion of fillings, which in this case are inlays. They were not prophylactic measures, to be sure, but the above claim holds just the same.

The people under consideration are the

Mayas and the inhabitants of Ecuador. The pre-Columbian Maya civilization comprised in Mexico the states of Tabasco, Chiapas, and the peninsula of Yucatan, British Honduras, about two-thirds of Guatemala, and a considerable portion of Honduras, including the headwaters of the Copan river.

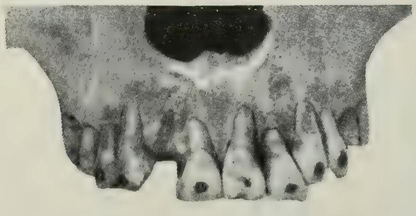
Fig. 6.



Skull with teeth inlaid with jadeite; from Chalchicomula, Puebla, Mex. (Ethnographic Museum, Munich.)

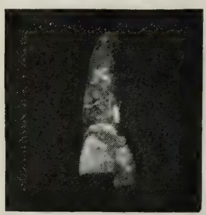
The Maya culture(³⁰), 160–600 A.D., is in its conceptions not related to that of Egypt, India, or China. Some authors, Lord Kingsborough and Dr. LePlongeon among others, have attempted to identify the nations of America with the lost tribes of Israel, but the evidence is insufficient and usually untrustworthy. This not only shows that they are the first on record, but also that their art is purely American. The ancient sculptures representing gods(³¹) show in many instances the projection of one or two teeth, either upper or lower, in some cases being represented as terraced(³²). Dr. Chervin(³³) mentions the head of a terra-cotta statue found at Tejar near Medellen, Mexico, the mouth of which is open, showing the upper teeth with cylindrical holes in them, having a diameter of 3 mm. and 1 mm. in depth. This might indicate that these mutilations were made for idolatrous purposes, and practiced probably by the priests, but it shows that the teeth played an important part in the glorification of their deities and was probably the origin of the art of teeth decoration on the living subject.

Fig. 7.



Skull with teeth inlaid with gold; from Atacames, Esmeraldas, Ecuador. (British Museum.) (After Marshall H. Saville.)

Fig. 8.



(Mexican collection of the Peabody Museum.)

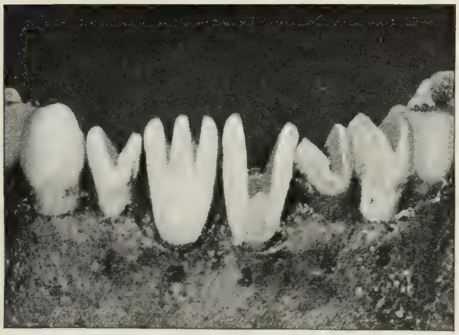
The development of this art must have taken considerable time, and accepting the belief that its height was reached during the period of the highest Maya culture, 460–600 A.D., it may be safely assumed that it dates as far back as 200 A.D.

Accepting the theory that filing of the teeth preceded the making of inlays, although no proof of this is at hand, a few specimens are shown. Fig. 3 shows a skull found in Sayata, northern Argentina(³⁴). This is only one taken from about five hundred found around Sayata, but is unlike the others in that it shows more perfect and better finished work.

Fig. 4 is the photograph of a skull showing a different mode of filing, but of much later date, probably 1000 A.D., being found at Labna, Yucatan, which was the center of Maya culture after their migration to the north. In Fig. 5

we see more specimens, some being filed only, others having inlays added. Specimen *j* was found at Tecolpa, Chiapas, and collected by Saville in 1897. It is an upper incisor filled with jadeite. Specimen *k* is from the ruins of Copan, Honduras, found by Saville, and now preserved in the Peabody Museum of Harvard University. The tooth is also filed at both corners, and has in it a jadeite inlay. Specimen *n* shows a case of filing alone, similar to the one in the skull Fig. 4; *o* resembles the mode of filing as practiced in Northern Argentina, and *p* has only one serration instead of two. In Figs. 6 and 7 we see two skulls, one from Mexico and one from Ecuador, illustrating inlays in the teeth. In Fig. 8 we see a tooth from Copan with only a mesial step, and in Fig. 14 there are two more specimens illustrating this custom.

FIG. 9.

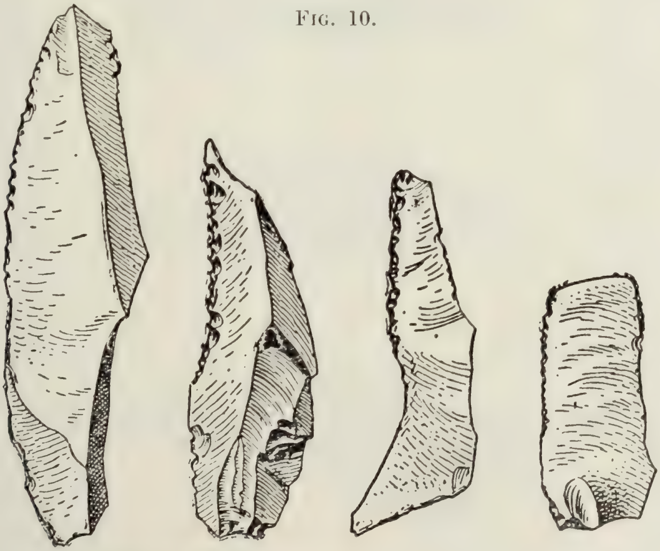


Muller's reproduction of the mutilation from Sayata.

INSTRUMENTS USED IN FILING TEETH AND PREPARING CAVITIES FOR INLAYS.

The Mayas and the other South American peoples had no metal implements of any kind, as far as we know at present, so the next question to consider is, How were they able, with the chipped stone implements at their disposal, to produce the results obtained? Dr. Chervin(³⁵) asked the services of Mr. M. Muller, a specialist in reproducing things prehistoric, to try to see if these results could be obtained with such implements. Mr. Muller procured the body of a boy who had died in a public institution in Paris and proceeded to demonstrate the several modes of filing the teeth in vogue in South America. He succeeded as is shown in Fig. 9.

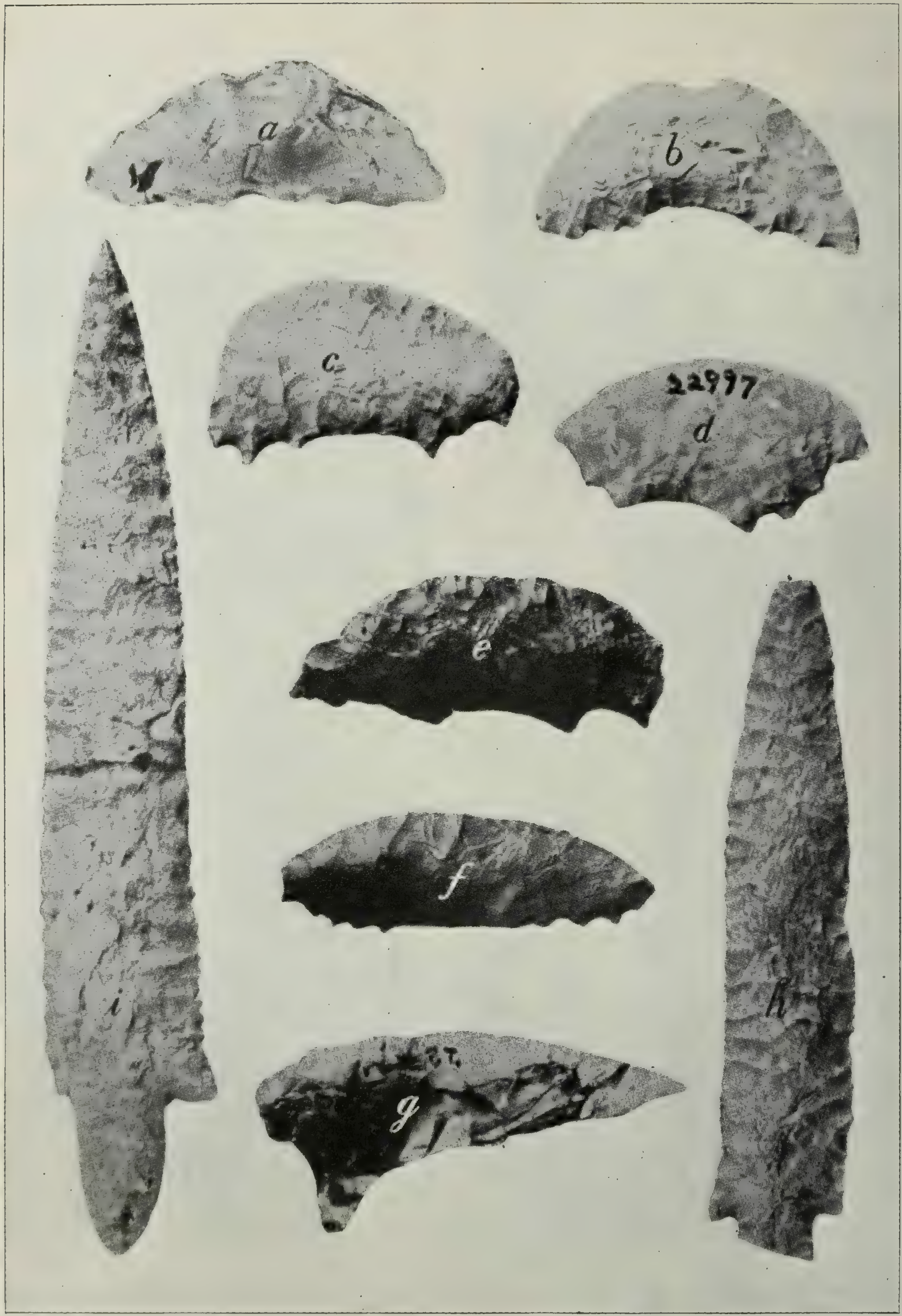
FIG. 10.



Flint implements used by Muller. (Three-fourths actual size.)

The implements used by him are shown in Fig. 10, and although not

Fig. 11.



Chipped stone implements of surgery (?) from San Miguel Island. *a–f*, scarifiers; *g*, lancet; *h*, *i*, knives. (Actual size.)

identical with the ones(³⁶) shown in Figs. 11 and 12, they are for all practical purposes the same as the ones marked *a, c, e, f,* in Fig 11.

We now have the proof that such operations could be performed with good results, as shown in Fig. 9. Wardell, writing on this subject(³⁷), says—"Unfortunately, it is now impossible to determine whether these seven pieces which, upon a recent overhauling of the collection, were found by the writer grouped together, along with two slender knife blades—to which reference is made later—came from a single burial and were possibly once the property of some native 'specialist,' or, scattered through several graves, represent the activities of various medicine men. Be that as it may, they show amid their variation a strong family likeness, a peculiarity and specialization of outline, for which it would be difficult to suggest other than surgical uses."

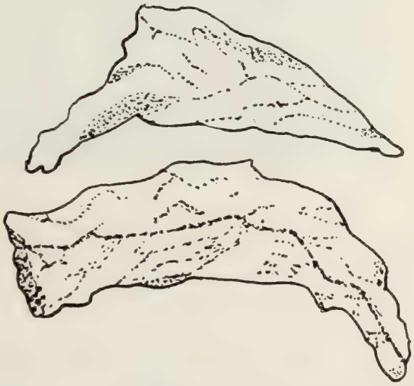
In Fig. 11(³⁸), *a* is supposed to be the most primitive piece, from which the others were evolved.

The New Zealand implements resemble very much the one marked *g* in Fig. 11, but their having any historic significance is very difficult to determine. It seems very probable, however, that implements of this sort were used.

The practice of this custom of filing the teeth among the Mayas, also among some South American peoples, was no doubt for the purpose of adornment, and not proof that they were flesh-eaters, as maintained by Dr. Andrews(³⁹) in describing the Labna skull. I doubt that the filing of the teeth has any relation to the eating of meat, since we find filed teeth in Figs. 13 and 14, both representing teeth belonging in each case to an individual skull, finding in each skull but two filed teeth, and it cannot be claimed on the strength of their presence that these people were flesh-eaters. Though they *were* flesh-eaters, the filing of teeth bears no relation to that fact. That it was for adornment may be proved by the presence of filed teeth in sculptures representing gods, and by finding them together with teeth inlaid with substances of different color. Saville(⁴⁰) says—"The decoration of the teeth is unique, and presents a new type of facial ornamentation." De Landa(⁴¹), writing of the native population of Yucatan, the Mayas, says—"They had the custom of mutilating the teeth, leaving them like the teeth of a saw; this they did for elegance or show. The work was done by the old women filing the teeth with certain stones and water."

The placing of the teeth in Fig. 13 is, so far as I am able to determine, incorrect, the upper lateral incisors being reversed. This I mention to avoid comment on the positions of the teeth.

FIG. 12.



Chipped stone surgical instruments; from New Zealand. (After Edge Partington.)

THE FIRST RECORDS OF INLAYS IN TEETH.

Another custom of the Mayas, also found in the Esmeraldas, which for our profession is most interesting, was the decoration of the teeth, principally the upper incisors, by the insertion of inlays of various colors. This custom was quite common in various parts of Mexico. In the Maya area(⁴²) as far south as Laborador, the substance most used was jadeite; in Mexico hematite was found to be used; in Vera Cruz turquoise has been found, and in other parts, teeth with rock-crystal, obsidian, and a red cement have been found. More recently one with iron pyrites has been found. Gold was also used, but is of later date, and nothing definite can be said concerning the period to which it belongs.

The occurrence of decorated teeth is extremely rare, very few specimens having been found, but this is no proof that the custom was not common in former times. The inhabitants of villages are incapable of appreciating the value of archeological material, as they hold in little esteem objects of antiquity; hence the loss, probably, of many specimens.

The number of teeth decorated in different skulls varies. Some have two, others four, six, and even eight, and the material used is not always the same. This is illustrated in Fig. 13.

The upper left central has a beautiful green inlay of jadeite, while the others have a red-brown cement, giving the person no doubt, to his conception, a beautiful appearance. The number of inlays in each tooth also varies, and I am sorry to say that this cannot be illustrated, the examples not having been released for publication. Suffice it to say that some have one, as shown in Figs. 13 and 14, and some have three. The two additional inlays are much smaller than those shown here, and are placed nearer the incisal edge. The three inlays decorating each tooth are of obsidian, a black glassy volcanic rock with very few individualized crystals, a perfect substance for the making of inlays. The absence of many crystals assures an exact line of cleavage, and gives the perfectly smooth margins so much desired in inlays. The setting of the inlay was accomplished with the aid of a cement, the color differing in different teeth.

FIG. 13.

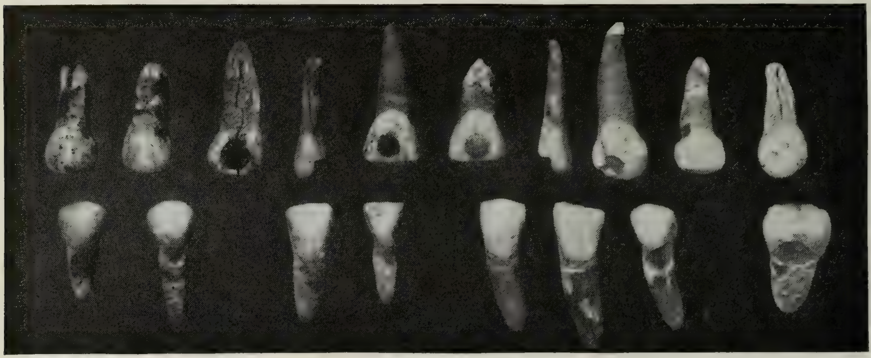
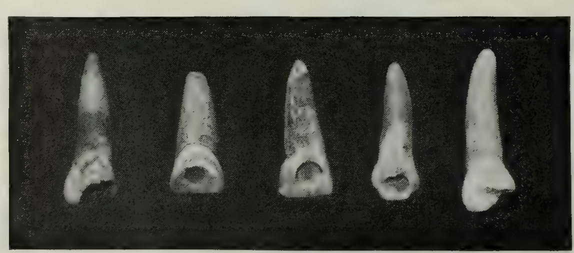
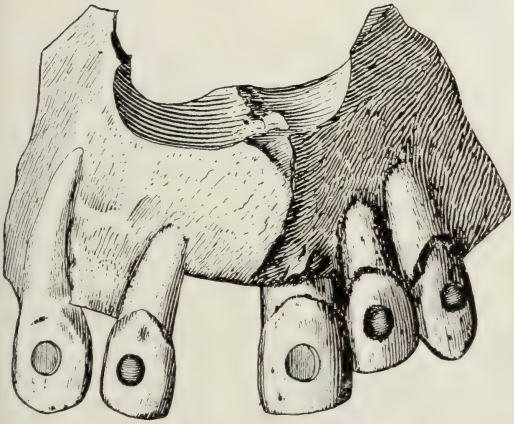


FIG. 14.



Considerable time must have been required for the preparation of the cavities, not only by virtue of the implements used, but also in consideration of the patient himself, as the procedure must have caused considerable pain; and the fact that none of the teeth examined showed discoloration due to putrescence of the pulp seems to substantiate this assumption. It is perfectly possible that these people knew of the advantage of coca in connection with the filing, as the people along the coast were addicted to the chewing of coca leaves(43) mixed with lime, exactly as are the Indians today in a large part of western South America. The filing process being slow allowed the pulp time to recede at the time when the deposition of secondary dentin was taking place. This process would continue as long as the filing did not approach the pulp too closely, and this explains why the pulp did not become involved.

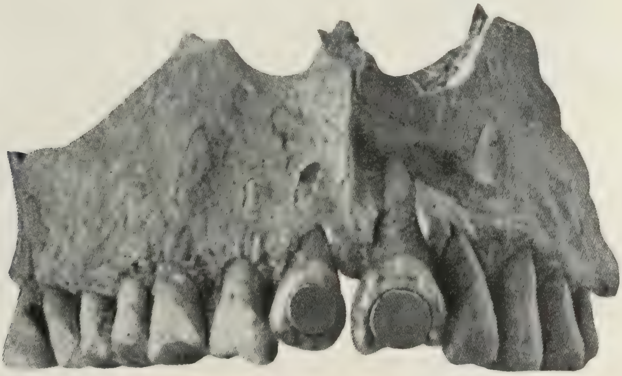
FIG. 15.



Upper teeth inlaid with gold; from Campeche, Mex. (After Hamy.)

The sizes of the inlays used can readily be judged by comparison with the teeth in the illustrations, remembering, however, that the latter are somewhat less than actual size in the reproduction. The colors represented by the inlays are green, jadeite; black, obsidian; red-brown, cement; reddish pink, iron pyrites; and blue, turquoise. As far as is known inlays occur only in the upper teeth, while filing can be observed in both upper and lower teeth. If the chipped-stone implements, described before, were used to make the necessary cavities, a rotary motion must have been used in order to accomplish the results obtained. This work was probably performed by someone in the community who had become proficient by experience. We should remember, too, that it is very difficult to do this work in one's own teeth without the aid of a mirror, and it is doubtful if mirrors were in use at that time. They could have used a vessel filled with clear water as a mirror, but even then the operation remains a very difficult one.

FIG. 16.



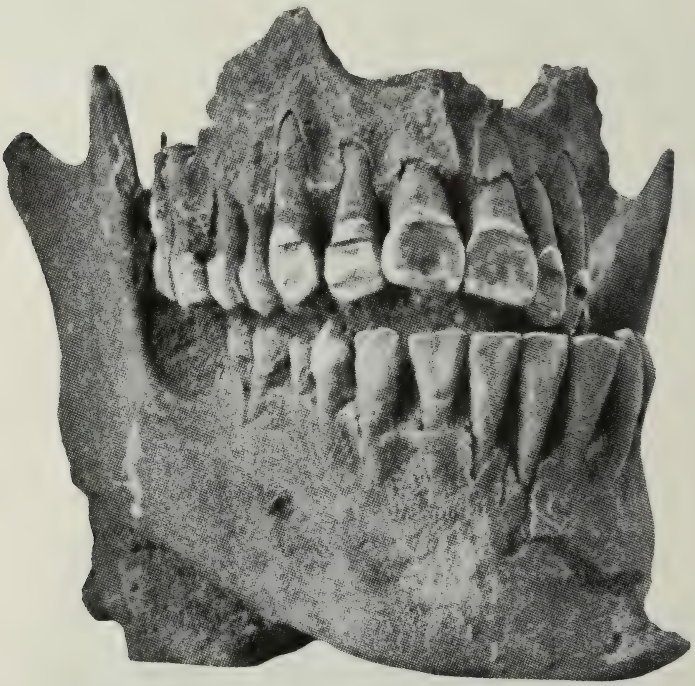
Skull with teeth inlaid with gold; from Atacames, Esmeraldas, Ecuador. (Heye Museum.) (After Saville.)

The time when this inlay work was performed cannot be exactly established, but the inlays found at Copan, Honduras, date back to the period of the highest development of Maya culture, 360–600 A.D.,* and probably earlier, but as Saville(44) thinks that the art of inlaying came from Central America to South America, it seems unnecessary to attempt to determine the exact date of the inlay work of the Esmeraldas, Ecuador.

GOLD INLAYS IN ANCIENT TIMES.

Gold inlays were used both in Central and South America, as shown in Figs. 15, 16, and 17, but they are of a later date, although the use of gold is claimed to be pre-Columbian.

FIG. 17.



Skull with teeth overlaid with gold; from La Piedra, Esmeraldas, Ecuador. (Heye Museum.) (After Saville.)

The question arises, however, as to whether the presentation of all this material proves that the teeth were decorated during life. The mere presence of inlays in teeth found both separately and in the skull does not prove by any means that the inlaying was done before death. It might be entirely possible that they were inserted after death, similar to the custom among the Egyptians of gilding the nose, chin, and teeth of their dead.

The absolute proof, however, rests with a few incisors now in the Peabody Museum* of Harvard University. One can see two upper central incisors, each having three inlays on its buccal surface, two near the incisal edge and one larger one in about the center of the buccal surface. The inlays are of obsidian, and upon close examination, the inlay being exposed on the cutting edge, wear can be observed, the tooth and the inlay being worn down in a straight line. This proves that the inlays were inserted during life.

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* Mr. S. Morley, a recognized authority on Maya culture, shares this opinion.

* These specimens could not be obtained for reproduction, they having not been released for publication.

The upper incisors in Fig. 17 are interesting, showing in one tooth two separate preparations, a small round one followed by the almost complete removal of the buccal enamel of the crown; the other teeth not showing this might tend to indicate that the overlaying of the teeth with gold is a later development. One may surmise that the round cavities were produced last and the larger preparations first, but this supposition is not borne out by the indefinite margins of the small cavities, which in that case would have been more distinct.

Mr. Saville(⁴⁵) contends that the right central space in Fig. 16 is occupied by a right lateral tooth, from which he deduces this to be a case of implantation, accrediting it as such without furnishing further proof. He says, "This is such an extraordinary feature that we must weigh very carefully the evidence as to its having been found in this way." The position of the tooth in the jaw does not prove his contention at all, as it is possible that agenesia or impaction may account for the lateral having taken the place of the central. Continuing, he says, "Everything is in favor of this position; indeed, there is no reason to doubt that the replacement is a genuine pre-Columbian triumph of the ancient dentists of Atacames." But what does "everything" in this case prove? No evidence to support the contention is given, and I take the liberty of questioning the correctness of his conclusions.

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Some Essentials in Dental Radiography.

By B. FRANK GRAY, D.D.S., Colorado Springs, Colo.

(Read before the Colorado Springs Dental Society, June 1917.)

BY common consent the roentgen ray is one of the most valuable diagnostic agents known to the medical and dental professions. If it were more intelligently applied and radiographs were more carefully interpreted there would soon be few who would not consider it indispensable in almost every department of dental practice.

All professional men who make radiographic pictures or endeavor to interpret them should understand, grossly at least, how the picture is really produced. In ordinary photography, sunlight or artificial light produces the impression on the sensitized photographic film; whereas in radiography the X-rays furnish the illumination.

An X-ray picture is said to be a "shadowgraph." So it is, in the particular that the outlines of the object pictured may be distorted, viz, elongated or foreshortened, broadened or narrowed, depending on the relative positions of the object being radiographed and the sensitized film, together with the direction in which the rays are projected. But in shadows, as we commonly know them, the object casting the shadow is certainly not actually penetrated by the light, as with the X-ray. In radiography the picture depends, in large part, upon the relative degree to which the object pictured may be penetrated by the ray. It is a question of the resistance of the medium interposed between the X-ray tube and the film or plate on which the picture is to be registered. The interposing media, in most of the cases in which we are interested, are the soft tissues of the face, the gum tissue, the alveolar process, the teeth and filling materials within them, and the various prosthetic appliances.

In the film that portion of an object or organ least penetrable by the X-rays will appear lightest. Thus a gold bridge, crown, or filling stops practically all the rays, with the corresponding light outline on the film. If you will observe, the porcelain facing of a bridge, where not backed with metal, shows a darker outline than that portion of the facing backed with gold, thereby showing the porcelain to be somewhat penetrable by the rays, while the remaining part of the bridge may not be so at all.

VARIATION IN PENETRABILITY OF THE TISSUES.

The commonly noted dark lines in dental films at the periphery of the teeth (see Fig. 1) are readily accounted for when one considers that sometimes teeth are radiographed at just such an angle as leaves exposed to the rays the membranes of both the tooth and the alveolus, to a depth of possibly one-sixteenth to three-sixteenths of an inch. The penetration at this immediate point is much greater than at any other, perhaps, and yet the resulting picture has no pathological significance. It is quite possible, in any such case, that a change in the angle of exposure will produce a picture from which these dark lines are eliminated. That is to say, where in the first instance there was a considerable extent of soft tissue directly exposed, in the latter case a greater bulk of resisting structures has been interposed. In some instances useful teeth have been sacrificed because of the assumption that these dark lines indicated infection.

As to foci of infection, there are a great many viewpoints. While some of them may be purely speculative, there are a few considerations which appeal to the reason, and which I believe may be capable of demonstration in the laboratory. When we examine a radiograph of a healthy tooth we may expect to find a correspondence between the tissues as pictured at the apex of the root and those of the surrounding alveolar process. If there be a relatively dark area at the apex, we should endeavor to determine its cause. Of one thing we can always be sure—this darker area, compared with its immediate surroundings, is due to a lessened resistance to the penetration of the X-rays at that immediate point.

FIG. 1.

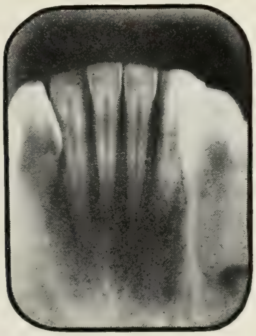
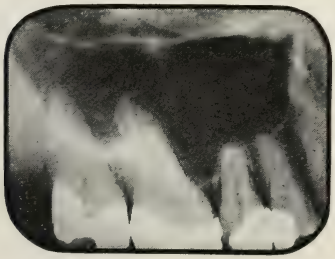


FIG. 2.



It must always be remembered, of course, in making radiographs of the maxilla, that the antrum of Highmore often intervenes between the tube and the film, and the antral walls do not offer as much resistance to the rays as do the bony structures adjacent to the antrum. Therefore we have very large and very dark areas over the roots of bicuspids and molars in some cases (see Fig. 2). These shadows have no pathological significance; they serve to confuse us in interpreting conditions at the apices of the teeth in that region. So we must learn to distinguish between those antral shadows and the areas resulting from a lessened bone resistance due to pathological processes, which may point to infection. These latter rarefied

FIG. 3.

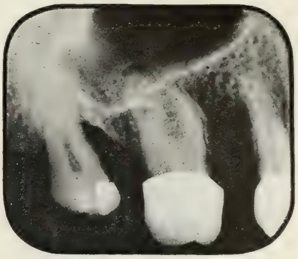


FIG. 4.

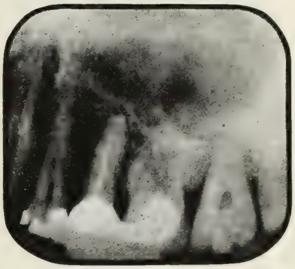
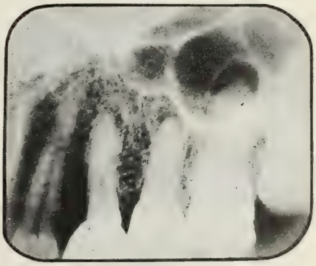
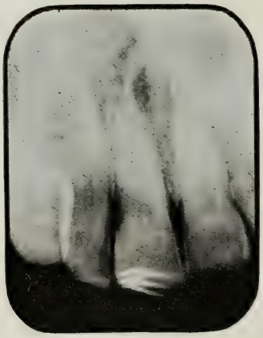


FIG. 5.



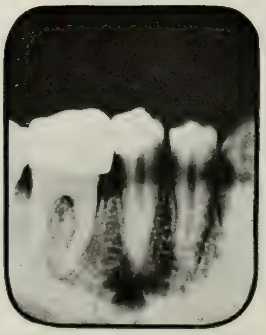
areas will often be detected within the already darkened area brought about by the antrum as explained. It is a doubly dark area for which we need to look, usually very different in both outline and extent from the antral shadow. A tolerably good illustration of this is given at the apices of the first molars in Figs. 3, 4, and 5.

FIG. 6.



Again, we must remember the anterior palatine canal or foramen, which may cast a distinct shadow at the median line, and well above the junction of the upper central incisors with the alveolar process. In Fig. 6 the foramen is pictured near the apices of the incisors.

FIG. 7.



In the mandible, as we are from time to time reminded, we are to remember the mental foramen, which casts a shadow near the apex of the second bicuspid. (Fig. 7.) But the location of this foramen may vary to the anterior or posterior, or up or down. In one case recently examined the foramen was at the very apex of the tooth, or exactly opposite the apex. After "positive" diagnosis of a focus of infection had been made, the tooth was proved to be vital. We then made additional radiographs at varying angles, and the area outlined showed itself to be due to the foramen. At best, however, it was most confusing. This would point to the oft-suggested wisdom of availing ourselves of auxiliary diagnostic agencies in such cases.

The thin alveolar process and the mandible itself, in the region of the lower incisors, unless a proper technique is observed in making the radiograph, may cause a dark and rather extensive area including several teeth, as in Fig. 1.

Bearing in mind these exceptions and these landmarks, we may return to a consideration of the lessened resistance of the tissues to X-ray penetration at the apex of a tooth root.

INTERPRETATION OF "DARK AREAS."

The dark areas which we associate with foci of infection we may feel reasonably sure in ascribing to a disintegration of the bone at that immediate location. Granting the area *is* due to bone disintegration, it may not be wholly proper to assert that in every instance infection is present, for we must remember that a hollow space in the bone, completely sterile, would produce a very similar picture. I do believe, however, if in actual practice a thorough microscopical examination could be made, infection would be demonstrated in practically all such designated locations. Certainly, infection must usually have been present to bring about the disintegration of the bony tissue, and certain it is that anything like normal tissue has never been restored. Many such cases, showing decidedly dark areas, after careful treatment—or root amputation for that matter—have shown by subsequent radiographic examination a progressive clearing-up of the area until quite a normal showing has been attained.

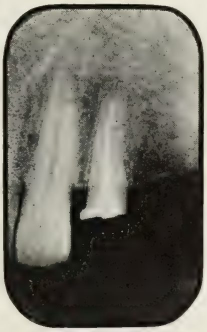
Granting that organisms of infection may usually be present in such areas as I have described, we may profitably reason about the matter in this way: We may remember that each one of us is beyond doubt daily subjected to infection of one sort or another, and in the majority of cases we do not suffer any appreciable ill effects. Why? Because our powers of resistance are so great that these agents of infection are inert. So infection at the apex of a tooth root today, tomorrow, or next year, *may* not bring appreciable trouble to a patient. His resistance may protect him. But resistance is a variable factor; it is high today and low tomorrow, and it would appear that an inclosed area of infection would be vastly more dangerous than the infective organisms which freely enter the oral or nasal cavities and find temporary lodgment therein. The point I wish to emphasize is this: Are we safeguarding our patient, even reasonably well, when we leave within his physical structure the products of bone disintegration and the agencies of infection?

UNFILLED ROOT-CANALS AS SOURCES OF INFECTION.

For a long time I have sought a satisfactory solution of the question of the unfilled or partially filled root-canal. In many radiographs we find one-quarter, one-third, or one-half—sometimes two halves!—of the root-canal unfilled. Not necessarily do we find so-called "areas" at the apex of the root in these cases. Shall we at once conclude that because no disintegration of the bone has taken place, there can be no infection present? Possibly in many cases this might be true, but I certainly believe infection may be present even where there is *no* area. We admit it usually to be a process of infection which breaks down and disintegrates the bone. This infective process had a beginning at some time, and just how long a time did it require to bring about a considerable disintegration of the bone? Until this latter was at least partly accomplished, no radiographic "area" would be possible. So I think it is wholly reasonable to believe that there may be a considerable period of time in almost any case when active infection is present, and yet the film may give no definite clue to its existence, unless we assume from the partly filled root which *is* pictured that infection may be present. I do not believe it can be shown that there may not be a continuous infective process going on under the conditions I have cited.

These are the questions being propounded by both dentists and physicians every day. I feel in the absence of absolute knowledge that the dentist cannot well afford to dismiss them too lightly.

Fig. 8.



For his own protection and for the welfare of his patient he may do well to guard his diagnosis, whether he be conferring with patients or with their physician. If the medical profession holds the extreme view that all non-vital teeth are bad teeth, so do I believe the dental profession at large maintains an extreme view in the opposite direction. With all the "prodding" of the medical profession, the average dentist is not in immediate danger of fully subscribing to their views. So far, I feel the criticisms directed against "non-vital" teeth have had a most beneficial influence in stimulating better technical methods in practice.

It seems reasonable and quite justifiable to assume that a tooth about which there is no "area," and which is shown to be well filled to the apex, might not be the source of any infective process. (See Fig. 8.) If the tooth root be imperfectly filled (although no "area" is in evidence), I think we need to guard our assertions, as it is possible we may one day be placed in an unpleasant situation. We should do well, at least, to qualify our diagnosis. (See Figs. 9 and 10.)

If a patient suffers from certain rheumatic symptoms, or from any one of a number of systemic troubles believed to be of infective origin, certainly these questionable conditions at the apices of teeth should be given more consideration than in the case of a perfectly normal and healthy person. It would appear that the dental profession can better afford to shoulder the responsibility of eradicating all possible foci of infection in such cases than it can afford to assume that no infection is present, in the absence of any real proof.

Fig. 9.

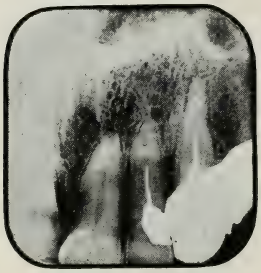
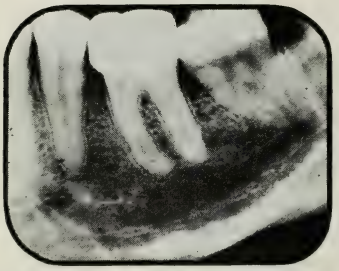


Fig. 10.



In those cases where the radiographic examination reveals pronounced areas which are correctly interpreted within the meaning of the term, proper measures should be taken at once to eradicate the indicated foci of infection. (See Figs. 11 and 12.)

This whole matter harks back to the question of conserving the vitality of teeth as a great prophylactic measure. Failing in that, we are confronted by the technical difficulties of efficient root-canal work. We all realize what these difficulties are, but let us not place stumbling-blocks ahead of us. To believe a thing cannot be done is to half acknowledge defeat at the outset. One of the best signs of a man's progress is his willingness to face his own shortcomings. Until then he may not render the best service of which he is capable, in the very nature of the case. Let us not view a particular technique nor the result accomplished in a wrong perspective merely because it is time-honored. Would we not better learn to criticize our own methods in a wholesome way, and be open to improvement? With such an attitude criticism of the efforts of others will lessen, and we may, with reason, expect our own progress to become increasingly satisfactory.

Fig. 11.

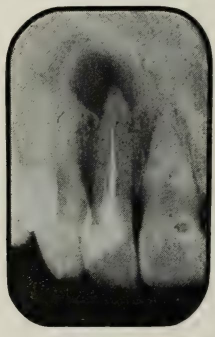
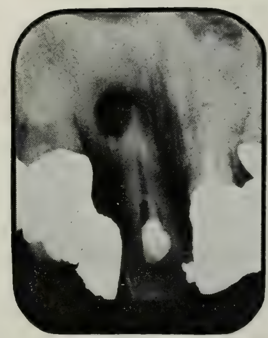


Fig. 12.



Type *vs.* Temperament in the Selection of Teeth.

By NORMAN S. ESSIG, D.D.S., Philadelphia, Pa.

THE systemic classification of the organs of mastication has frequently claimed the serious attention of the leading thinkers in the department of dental prosthesis.

Recently the writer was present at a discussion by several men of this type, all of whom were earnest and sincere in their convictions, with no other interest at heart than the desire to benefit the dental profession by an effort to solve their problem scientifically and systematically, and to apply its principles in a simplified form for practical use.

Such a problem is "type *versus* temperament," with all the ramifications incident to a department having as components the converging lines of art and engineering, leading to situations in prosthetic practice which always demand a compromise.

After many years of close study, during which the writer has created a liberal library of models from mouths of persons whose temperamental characteristics are perfectly known to him, it would be fair to state that the individual average is expressed neither by the term "type" nor "temperament," except for purposes of convenience. Appropriate harmonious discord, and suitable adaptation and alignment, modified by age and wear, is the average expressed in the mouths of the civilized human race as we deal with their problems today.

The data collected by Dr. J. L. Williams have greatly simplified and established on a scientific basis the classification of teeth, and in reality have put a foundation under the temperamental theory, and to him therefore belongs the credit of establishing the three great types which obtain in the evolution of all human dentures, as well as in some of the lower animals. The establishment of these types makes it possible for one teaching the subject to show clearly and definitely why the so-called temperamental classification has a legitimate place.

In studying the anatomy of human teeth and their classification we must accept without reserve several scientific facts which have been brought out and established within the last few years. The result of these investigations reveals conclusively that there are but three fundamental types, and nothing has yet been discovered to show that racial characteristics and environments, or other conditions mundane, have in the past done anything to greatly modify these three primal types, so long as men and women married more or less according to tribal and religious laws.

It seems reasonable to suppose that the greatest change began when these laws were no longer observed, and the various branches of the human race began to intermarry into other races or tribes of distinctly different racial and typal characteristics.

When we study the subject from the present-day standpoint we may forget why certain conditions exist and how they came about, but we must remember that in the chaotic state that now confronts the student of human teeth there is one fact that is as true and as firmly established as the three great classifications themselves, to wit—that *human teeth are a law unto themselves.*

That there is possible such a thing as a temperamental classification is doubtful if we adhere strictly to the actual interpretation of scientific facts, but someone in days gone by saw fit to designate the classification as such, and from that time on there have been many who have accepted and adhered to this term —for, in fact, it is but a term. Of this we may be certain—that there can be no temperamental classification with respect to the three basal types the existence of which is attested to and borne out by the scientific study of all the great collections of crania in the world.

That there are innumerable modifications of the three great basal types cannot be denied, and it is to this fact that the word temperamental in all probability owes its application to the classification of the human teeth; therefore for all practical purposes the term is a satisfactory one to the dental profession, provided that in the use of the term temperamental they do not discredit the scientific soundness of the typal classification. In other words, the difference is one of nomenclature only, and those who are advocates of the term temperamental have reason to be thankful for the investigation that has led to the classification of teeth into three great basal types.

Physiologically, temperament only affects teeth in so far as the bony structure surrounding them governs and influences their growth and development, just as any other process of nature which emanates from a germ or capsule is affected by its surroundings and the source of its nourishment.

The marriages of today are so heterogeneous that of all nations we in the United States have developed greater variation, and have greater recourse to orthodontia as a means of correcting the irregularities produced by the intermarriages of a mixed population such as is represented in the western hemisphere. This will in all probability be maintained until we have so far assimilated our population that a true American type shall be ultimately established. I believe it to be true that in districts where there is no periodic influx of foreigners, and where those living in such districts marry largely among themselves, there are fewer cases of marked dental irregularity, and the regular alignment of the organs of mastication is the rule rather than the exception.

A high order of vitality or a lack of it is never expressed by a single tooth, nor could a single tooth betray a highly organized nervous mechanism, or the reverse, expressed by the terms phlegmatic or plethoric as used in the temperamental classification; it is only in the appropriate alignment and artistic arrangement that these human characteristics are portrayed. These efforts bestowed intelligently can portray temperamental attributes (if we so designate it) if harmony of lines be maintained; or, in other words, if we create an harmonious discord we can at least produce a highly artistic result that does not attract attention; this, in any event, is the highest artistic expression of dental prosthesis.

There are many ways of explaining the so-called incongruities of nature, but only after thoroughly familiarizing ourselves with the anatomy and physiology of the human teeth can we begin to see the relations of cause and effect as represented in the teeth of the human race as we come in contact with them in our daily work.

The dental profession has been shown conclusively that there are three distinct types of teeth, regardless of the formation of the skull in which they are found. It has also been demonstrated that there are many types resulting from the blending of these standard forms that cannot be classified with any one of the three distinctive types upon which we depend as a basis of classification; but nothing has been done to show how these nondescript teeth are related to the true types, or how the dentist may trace the teeth in question back to the original forms.

It is the purpose of the writer to show later how this may be done, and what relation the subject bears to the reformation of porcelain teeth to adapt them to special cases. This specialty will always require artistic skill and manipulative ability on the part of the operator, and, as with art in every other phase, the personal equation will forever dominate.

1700 Locust st.

Some Engineering Principles of Possible Interest to Orthodontists.

By GILBERT D. FISH, C.E., New York, N. Y.

(Read before the Eastern Association of Graduates of the Angle School of Orthodontia, New York, N. Y., May 7, 1917.)

ENGINEERING students first study science in analytical subjects—mathematics and physics. They learn to examine problems by applying the tests of theory, according to laws which admit of no exceptions. Propositions may be pronounced sound or unsound according as they satisfy principles or fail to do so. The engineering student makes the acquaintance of empiricism later in his course, after he has completed his studies in pure science; if he has acquired the proper point of view, he regards empirical formulæ and rule-of-thumb methods as among the evil necessities of applied science, and avoids the use of them wherever he can apply analysis instead.

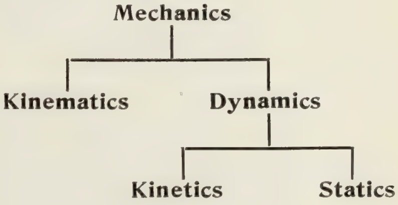
Students of medicine and dentistry, because of the nature of their subjects, learn to depend on observation and experiment, and have little occasion to apply analysis. That is the reason why, when they undertake problems in which they might be helped by the methods of the more exact sciences, they rely on clinical experience to reveal the solutions, and adhere to the idea that nothing which involves living tissue is susceptible of exact treatment. For that reason orthodontia has remained purely experimental—an art based on experience.

APPLICATION OF ENGINEERING PRINCIPLES TO THE MECHANICAL TREATMENT OF MALOCCLUSION.

The primary purpose of this paper is to point out the fact that the treatment of malocclusion by mechanical means can be conducted rationally only by due observance of engineering principles. A secondary object is to present a few of the basic laws of mechanics applicable to appliances for moving teeth.

Do not suppose that I deprecate the investigation of malocclusion as a biological problem, or that I disparage clinical experience in the study of the behavior of the tissues during and after treatment. I state merely that orthodontists cannot afford to construct and operate mechanical appliances with their customary disregard of the laws of physics.

FIG. 1.



Analytical mechanics is a pure science, consisting in the mathematical expression and interpretation of the natural laws governing force and motion. Technical mechanics is the application of these laws in the practice of engineering. Analytical mechanics is considered to be divided according to the scheme of Fig. 1. *Kinematics* treats of motion, without reference to the forces and other circumstances of motion. *Dynamics* is the mathematical treatment of force and the other circumstances of motion; *kinetics* is that branch of dynamics which deals with variable motion, while *statics* deals with uniform motion and rest.

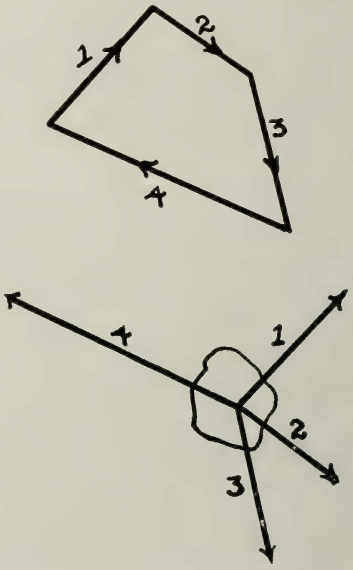
Problems relating to movements of teeth, without reference to the forces involved, are handled by kinematics. Dynamics must be used in analyzing appliances, because the carrying out of the tooth movements depends on the scientific application of force. The movements of teeth and of appliances attached to them do not come under the head of uniform motion; therefore the forces and other circumstances are, strictly speaking, kinetic. From the engineering standpoint, however, an appliance in the mouth is so nearly stationary that it may be analyzed as a static structure. A static structure is one which is in equilibrium; the external forces acting on the structure are all in balance. The simple laws of equilibrium provide the means for analyzing the reactions between an appliance and the teeth to which it is attached.

According to Newton's law of the relation between action and reaction, whenever one body exerts a force upon another, the latter also exerts a force upon the former; the two forces are equal in magnitude and have a common line of action, but act in exactly opposite directions. The reciprocal force action between these two bodies is called the "reaction" between them. When an appliance exerts a force upon a tooth, the tooth sets up a reactive force against the appliance equal and opposite to the force exerted by the appliance. This reaction between the appliance and the tooth is the force which causes the tooth to move in its foundation; it is at the same time one of the reactions on the appliance.

If an appliance is attached only to the teeth, then the reactions of the teeth upon the appliance are the only external forces acting upon the structure. The appliance is in static equilibrium, just as the great steel arch carrying a railway across Hell Gate is in equilibrium; the external forces necessarily balance, and must follow the laws of equilibrium. If the appliance is simple, so as to be statically determinate, these forces may be analyzed, and their amounts and directions may be determined.

Any force may be represented by a straight line of certain length, direction, and position. The length of the line measures to scale the magnitude of the force; for instance, a 20-gram force may be represented by a line 20 millimeters long, the scale being 1 gram to the millimeter. The direction and position of the line represent the direction and position of the action-line of the force. An arrowhead on the line serves to show the *sense* of the force, that is, whether it is going or coming.

FIG. 2.



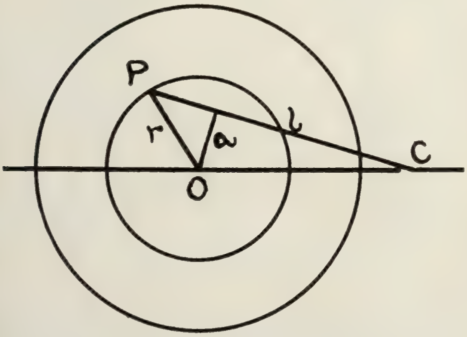
Equilibrium concurrent forces.

Let several forces in equilibrium act through a common point, as shown in Fig. 2. If lines, or *vectors,* representing these forces in direction and magnitude, be arranged in a chain as shown at the top of the figure, they form a closed polygon—that is to say, the last force ends where the first one commenced. The forces may be taken in any sequence. The converse is also true: if the force polygon for a system of co-planar concurrent forces is found to close, then it is known that these forces are all in balance.

It is to be noted that the effect of a force on the state of rest or motion of a body does not vary with the location of the point in the line of action at which the force is applied. The forces shown in Fig. 2 are represented as pulling away from a common center; but, so far as the equilibrium of the body is concerned, they might just as well be pushing or pulling, or they might be applied through external attachments. The same principle applies to forces which do not pass through a common point, or which do not lie in a common plane, or which are not in equilibrium. This point I shall emphasize presently.

Before developing the theory of equilibrium for non-concurrent forces (forces having action-lines which do not pass through a common point), I must introduce the principle of *moments.*

Fig. 3.



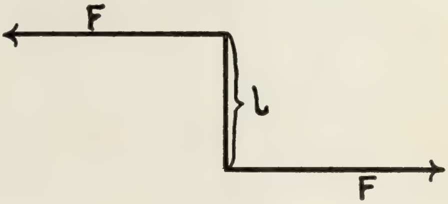
Wheel and connecting-rod system.

Fig. 3 shows a wheel and connecting-rod system, as used in reciprocating engines. The force imparted to the piston-rod is transmitted through the cross-head *C* to the connecting-rod *CP,* and finds its way into the wheel through the crank-pin *P*. The effect is not to push the wheel forward, for the wheel is fastened to the engine frame at its axle *O;* the effect is to rotate the wheel about *O*. The effect is produced by the moment of the connecting-rod thrust about *O;* this moment is the product of the force in *CP* multiplied by its perpendicular distance *a* from *O*. The distance *a* is the *lever-arm* of the force, and is just as necessary to the rotative effect of the force as is the force itself. When the crank-pin is on dead center—that is, on a line with *O* and *C*—the arm *a* is zero, and no rotating effect can be produced.

TWO KINDS OF MOTION: TRANSLATION AND ROTATION.

At this point let me announce the first principle of kinematics. There are two kinds of motion, *translation* and *rotation.* Pure translation is a change in position, or bodily movement, of an object without any change in direction of any of the axes or lines of the object. Pure rotation is a change of direction, or turning, of an object about some axis passing through its center of mass, without any change in position of the body as a whole. The wheels of a traveling locomotive have combined rotation and translation: they rotate about their axles, and in addition they move bodily along the track. The tendency of a force acting through a center is to produce translation; the tendency of a moment is to produce rotation.

Fig. 4.



Couple.

A pair of forces like those of Fig. 4 is called a *couple.* These two forces are equal in magnitude, parallel in direction, and opposite in sense, and there is a distance l between them. The tendency of a couple is purely rotative, and this tendency is measured by the product of the force F multiplied by the distance l. This product $F \cdot l$ is the moment of the couple. There can be no translative tendency, because the two forces exactly balance each other except for their tendency to rotate the object to which they are applied.

Now we have seen that the effect of a single force on the state of equilibrium or non-equilibrium of a body depends on the magnitude, the line of action, and the sense of the force, and is independent of the location of the point on the line of action at which the force is applied. Similarly, the rotative effect of a couple depends only on the moment, the plane of action, and the sense of the couple, *i.e.* whether clockwise or counterwise; the effect of the couple does not in any other way depend on the positions, directions, or amounts of the forces composing the couple.

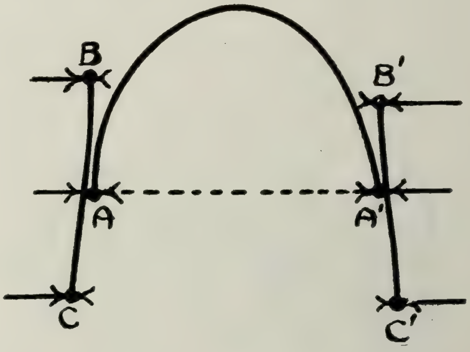
If several couples in the same plane act on the same body, the resultant effect is merely the algebraic sum of all. For instance, if there be two clockwise couples of 20 gram-millimeters each, acting in opposition to a counter-clockwise couple of 30 gram-millimeters, the net effect will be simply 10 gram-millimeters acting clockwise. If equilibrium is to obtain, the resultant effect of all couples must be zero, *i.e.* the counter-clockwise couples must counterbalance the clockwise couples. The same principle, worded differently, is to the effect that the algebraic sum of all moments about any point shall be zero, if equilibrium is to obtain.

LAWS OF EQUILIBRIUM.

Equilibrium, then, is a state in which all forces balance not only as to their translative tendency, but also as to their rotative tendency. While a body in equilibrium may be either at rest or in motion, there is nothing to change that state of rest or of uniform motion. If a body, as for instance an appliance attached to the teeth, is known to be in equilibrium, then it follows that all the forces acting between the teeth and the appliance must form a system in equilibrium. A polygon of forces drawn as previously shown must form a closed figure, even if those forces acting on the appliance do not pass through a common point. Also the moments of these forces must balance about any chosen point.

If the appliance is designed so that the number of unknown quantities does not exceed the number of laws of equilibrium which can be applied to the case, the forces are determinate. To illustrate a simple and very important case, let Fig. 5 represent an elastic arch wire hinged at both ends and thus connected with side yokes *BC* and *B′C′*, and let the yokes be hinged fore-and-aft to bands. The hinge principle, much used in civil engineering, is to the effect that no couple or moment can be transmitted through a hinge at right angles to the hinge axis; only direct force can be transmitted. Analyzing the arch as an independent body, it is immediately seen that no hinge reactions are possible other than direct forces, equal and opposite, acting along the line joining the two hinges. To disprove the contrary, it is necessary only to point out (1) that if either force acted along a line which did not pass through the other hinge, that force would have a moment about that hinge which nothing could counterbalance, and (2) that if the two forces were not equal and opposite, they could not balance each other. To ascertain the magnitude of the reciprocal force across the hinges, we have to consider the internal stresses in the arch wire, as indicated later.

Fig. 5.

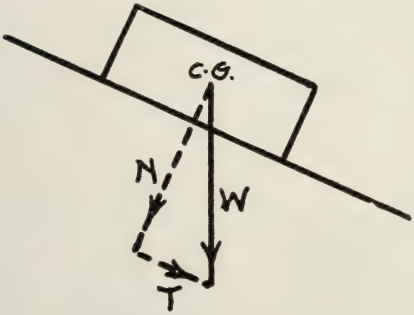


The force transmitted through either hinge (as *A*, Fig. 5) finds its way through the hinges *B* and *C* to the bands on the teeth. The laws of equilibrium, applied to the yoke *BC*, show that the forces of reactions at *B* and *C* are parallel and opposite to the force applied at *A*, that the sum of the two is equal to the force at *A*, and that their amounts are inversely proportional to their distances from *A*, the greater reaction being at the point nearer *A*.

Analysis of forces, whether in equilibrium or not, is facilitated by the processes of resolution and composition, now to be explained in part.

In Fig. 6 the weight of the object, which rests on an inclined plane, is represented by the vertical line or vector *W*. It may be resolved into two component forces *N* and *T*, one perpendicular to the inclined plane and the other parallel to it. Or the force *W* may be resolved into some other system of components, two or more in number, of various directions and magnitudes. The conditions are as follows: The vectors, or lines representing these forces in magnitude, direction, and length must form a polygon or chain beginning at the starting-point of the vector *W* and ending at the finishing-point of *W*. The lines of action of these components must intersect on the line of action of the force *W*.

FIG. 6.



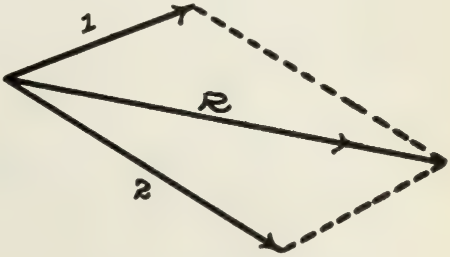
Resolution of force.

The purpose of resolving a single force into a number of component parts is to replace the force by some system of forces which may be more conveniently studied or handled than the single force.

COMPOSITION OF FORCES.

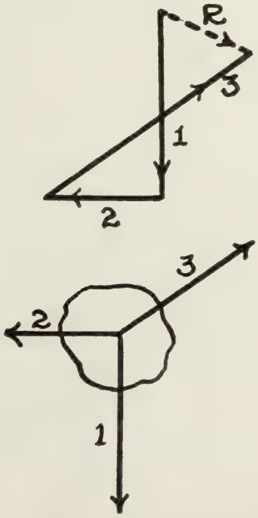
The inverse process is called composition of forces. Fig. 7 illustrates the so-called parallelogram of forces: 1 and 2 are a pair of forces to be replaced by a single force. The parallelogram of which the force vectors form adjacent sides is completed as shown by the dotted lines; the diagonal *R* is then the vector for the resultant force which may be substituted for the two given forces. The line of action of the resultant must pass through the intersection of the action lines of the forces which are replaced.

FIG. 7.



Parallelogram of force.

FIG. 8.



Composition of concurrent forces.

Fig. 8 illustrates the composition of several concurrent forces. By drawing a force diagram, in which each force is represented by a vector, it is possible to determine a single force, *R*, which shall be equivalent to all of the given forces combined. The vector representing R is simply the line drawn from the starting-point to the end of the force diagram; R is the resultant of the given forces.

In the diagram which was drawn to illustrate equilibrium of concurrent forces the resultant was evidently zero, because the resultant closed on itself. If a system is not in equilibrium, the force polygon does not close; the amount by which it fails to close measures the amount by which the forces are out of balance.

In a system where the forces do not pass through a common point, the same law of composition holds true; in this case, however, the resultant of the system in general is not only a force, but a force and a couple combined. Graphic or diagrammatic means for obtaining the resultant couple of a system are practical and convenient, but cannot properly be explained here.

It is a general principle, admitting no exceptions, that any system of forces acting on a body may be replaced by a single force and a single couple. The resultant force tends to move the body in a translative way, and the resultant couple to rotate it.

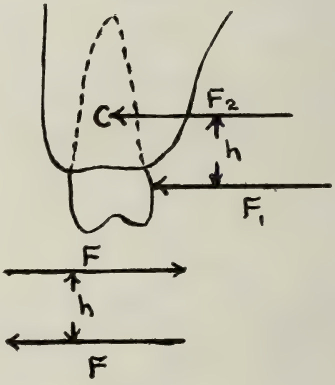
MECHANICS OF TOOTH MOVEMENT.

Let us now apply our mechanics to problems in moving teeth.

Fig. 9 is a mesial elevation of an upper right bicuspid. Let us suppose that a horizontal force is to be applied toward the cheek. There is a point C somewhere between the apex and the gingival margin, such that if the force be applied on a line passing through that point there will be no tipping and no rotation of the tooth about its long axis. This point may be called the *center of resistance.* It is undoubtedly somewhere between the gingival margin and the point half way to the apex. Of course this point may vary with variation of the intensity of force or with change in direction of application of the force.

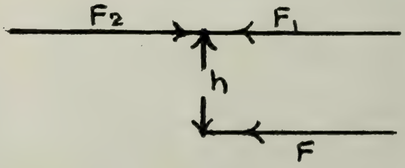
If it be desired to avoid the tipping tendency, the force may be applied along the line F_2; the impracticability of attaching directly to the root makes it necessary to extend an arm upward from a band around the crown of the tooth, keeping in mind the principle that it is the line of action, not the point of attachment, that counts. If it be desired to prevent tipping without applying the force opposite the center of resistance, it is necessary to use a rigid attachment or a vertical hinge between the band and the appliance.

Fig. 9.



In order to develop the idea further, I wish to point out a simple principle which follows from what we have previously considered. Any single force may be resolved into a single force of the same magnitude, direction, and sense, at some distance to one side, plus a couple. In Fig. 10 the force F is replaced by F_1, equal and parallel to F, but at any desired distance h to one side, and by a couple made up of F_2 and F, having a moment $F{\cdot}h$. Referring again to Fig. 9, we see that a force F_1, applied to the crown, may be resolved into an equal

Fig. 10.



force F_2 acting through the center of resistance, and by a couple $F \cdot h$ tending to tilt or rotate the tooth. The resulting motion of the tooth must be a combinaion of translation due to F_2 and rotation (tipping) due to the couple. Barring possible outside influences which need not be considered here, the effect of the couple will be to move the apex of the root in the direction *opposite* to the applied force.

Fig. 11.

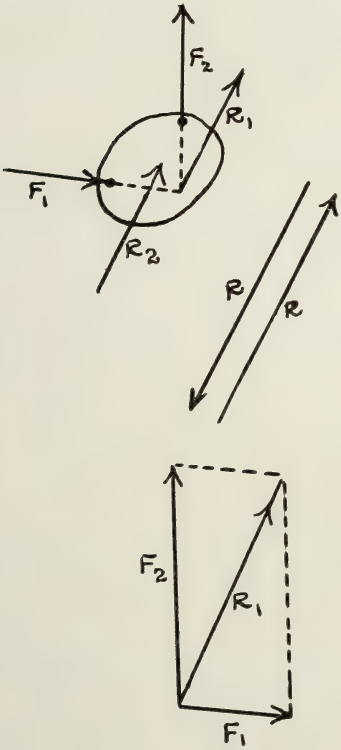


Fig. 11 illustrates another application of force analysis in appliance design. Let the two forces F_1 and F_2 act horizontally as shown. The parallelogram shows these forces, and their resultant R, to scale. The two given forces may then be replaced by their resultant, which must pass through the intersection of the lines of action of the given forces. In order to study both the translative and rotative tendencies of this resultant, let us make a further substitution, replacing it by an equal force acting through the assumed center of resistance and by a couple. The amount of the force through the center of resistance is shown to scale by R in the force diagram, and the moment of the couple is the product of that same amount of force by the lever arm between the center of resistance and the line of action of the resultant. Evidently, by varying the amounts or the lines of action of F_1 and F_2, various effects could be produced, including the special case of a resultant passing through the center of resistance and hence having no rotative tendency.

We must abandon this discussion of external forces and couples if we are to glance at the internal mechanics of elastic arches. It is impossible to give you any working methods for handling numerical problems in elastic deformation of arches, for this is a most intricate branch of mechanics. I shall first show you the result of an experiment in confirmation of engineering calculations as applied to a nickel silver arch under stress; and I shall close with presenting some general properties of elastic wires.

In Fig. 12, the outer arch is the form of an actual arch of nickel silver wire, before the application of force. Tension was applied across the ends by means of a rubber elastic band. While the arch was thus under stress, the distance between the ends was measured. The wire was known to be of uniform gage; this fact, combined with the known form of the arch when unstressed and the value of the span after deflection, supplied data sufficient for the calculation of the deflection at any point along the arch. By the mathematical theory of flexure, without experiment, the form of the arch under stress was determined; the calculated arch was plotted as shown in Fig. 12 (the inside arch). Actual test of the wire gave the form shown in Fig 13; this form coincides precisely with the theoretical arch when one is superimposed over the other.

Another part of the experiment was to calculate the tension in the elastic band which produced the deflection. A test of a straight piece of the wire had previously been made to ascertain the *modulus of elasticity* of the material, and the diameter had been calipered. The calculated value of the tension was 4 oz. 6 dwt.; the value determined by experiment was 5 oz. 0 dwt. The lack of agreement was not surprising, because my test to determine the elasticity had been very crude compared with the other parts of the experiment. To correct any impression of inaccuracy which may be conveyed by the above comparison, I shall mention a similar investigation, made last winter, of a light-gage platinized gold wire; the elasticity of the metal was measured more accurately than in the case illustrated, and the calculated value of the force across the ends of the arch agreed with the measured value within 1 per cent.

Fig. 12.

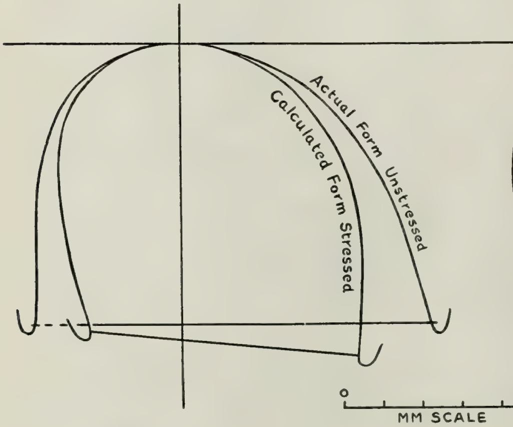
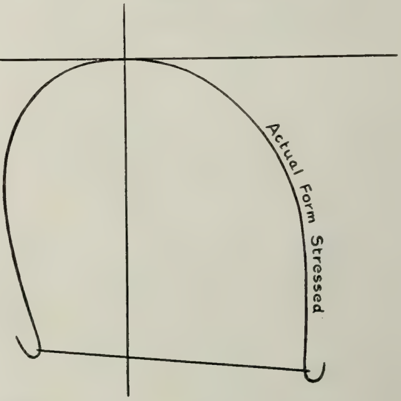


Fig. 13.



The main object of these experiments has been to ascertain whether the technical methods employed by engineers to calculate the deflections of steel structures weighing thousands of tons and suffering deformations scarcely perceptible to the eye, would practically apply to contrivances made of precious metal, weighing only a few grains and deforming greatly. The results are strikingly affirmative.

In general, the strain or deformation suffered by an elastic body is directly proportional to the stress causing it: twice the stress, twice the strain, and so on. In the case of direct stress (simple tension or compression), the ratio between the intensity of stress and the rate of strain is a factor known as the *modulus of elasticity* of the material in question. Steel undergoes less strain than gold for a given intensity of stress, hence it has a higher modulus of elasticity.

Bending stress is merely a combination of tension and compression; hence in an elastic arch the bending stress accompanying a given deflection is proportional to the modulus of elasticity.

The stiffness of a wire against bending is proportional to the fourth power of the diameter of the wire: twice the thickness, sixteen times the stiffness, and so on.

Again, the force required to deflect the end of a wire a given amount is inversely proportional to the cube or third power of the unsupported length: twice the length, one-eighth the force for a given deflection, or eight times the deflection for a given force.

APPLICATION OF PRINCIPLES DESCRIBED TO APPLIANCES.

To cite one application of the foregoing principles to appliance design: It is sometimes desired to employ a hinged expanding arch which shall not materially shorten fore-and-aft during expansion. The shortening of such an arch is due almost solely to the bending strain in the front part of the arch. If the front part of the arch be made of heavier gage than the sides, and the sides be extended far back and doubled forward so as to increase the unsupported length, practically the entire deflection is thrown into the flexible sides, the front forming a comparatively rigid yoke connecting the flexible sides. In this way the shortening of the arch may be minimized without loss of lateral flexibility.

If this paper has not fallen short of its purpose, it has impressed you with the desirability of using appliances which are mechanically simple, so that the forces may be analyzed, controlled, and properly directed. Mechanical simplicity and definitiveness are not to be found in such a device as the Angle ribbon arch; ask any engineer to analyze the forces exerted upon the teeth by such an appliance, and he will tell you that the factors are too uncertain.

Until orthodontists outgrow the use of indeterminate appliances, and borrow from engineering the practice of laying out on paper what you propose to do before you try to do it, orthodontia will continue to be purely experimental.

28 West 39th st.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

Grave Blunders in Preparing Root-canals for Pivot Crowns.

By FRANK W. SAGE, D.D.S., Cincinnati, Ohio.

ONE should be careful in the use of extra-fine and double-extra-fine root-canal bristles. I am convinced that not a few obscure cases of extra-apical inflammation and lasting soreness are caused by thrusting these fine bristles through the foramen, wounding the apical tissues, and possibly carrying infection into the apical area. Such an injury is slow to heal, and responds tardily to treatment.

Drainage and frequent renewals of absorbent cotton, with little other treatment, is indicated. Washing with a normal salt solution answers all requirements. These cases often linger for weeks, probably because of over-treatment, therefore patient waiting is to be recommended.

In preparing roots for crown pins some dentists seem to forget all they ever learned about root anatomy; they will drill an opening in, say, a lower incisor that is hardly more than a line in transverse diameter, as large as would be permissible only in a large-rooted upper incisor. Illustrations advertising pin crowns, showing, say, a post crown neatly adapted to an incisor or a bicuspid root, are apt to mislead the too-confiding, unreasoning dentist. In actual practice only a giant's tooth would accommodate a pin as large as these cuts often show. I long ago learned to greatly reduce the diameter and length of the pin in most fixed-pin crowns, which of course means reducing the caliber of the drilled opening. Not only are many openings for the pin too large, but they are too deep for safety. A short pin, hardly more than a quarter of an inch in length, is strong enough in most cases. With a short pin of diminished diameter one will have fewer roots splitting. The pin, however, should be squared or flattened.

It should be kept constantly in mind

that incisor roots, or any roots, are often constricted laterally, two or three lines below the gingival border, and hence arises the danger from drilling too freely. A Cincinnati dentist of national reputation recently had the courage and the candor to exhibit on a screen radiographs of incisor roots which he had unwittingly ruined, from drilling too deeply into the canals, or using drills that were too large. It needs to be kept in mind that the drill will often penetrate a root laterally without causing either noticeable pain or immediate hemorrhage, the bleeding manifesting itself a few moments later. In accidents of this description I have found no method better than the time-honored use of a carefully adapted lead cone driven into the puncture as far as required; after which the canal is re-drilled, using a smaller drill of course.

I believe too much stress has been laid on reaming the interior of the canal opening with the idea of giving the cement a better hold. A pivot tooth sufficiently shortened so as not to impinge on its natural antagonist seldom loosens, even if held only by a film of chloro-percha.

It has been claimed that a short pin, being a short lever, is far more likely to split the root than a long one. It is true that a short lever is more powerful than a long one, provided the fulcrum be fixed and immovable, but this rule does not apply practically in the instance of a pivoted tooth, for the reason that the fulcrum under strain gives somewhat, the root being slightly movable in the socket. My experience demonstrates the reliability of this conclusion, as I have not for years had a root to split.

Another point to be borne in mind is the fact that as one advances in years, losing molars and bicuspids, pivoted teeth will begin to impinge upon opposing teeth where formerly they swung clear of obstruction. These should therefore be ground as required from time to time. In a similar manner a natural tooth which formerly gave no trouble will begin to interfere with the occlusion. Some obstinate cases of pyorrhea may be corrected by this simple expedient of grinding down the teeth.

Some day I intend to write a book on the things dentists learn in practice, not from books but from personal observation—and then forget. We dentists need to consult each other more, the young men deferring to the older men's experience, the older men giving a willing ear to some things the young men have learned that are not familiar to the older men who have had no postgraduate advantages. The need of both classes for each other seems to be about equal.

The Groton, Seventh and Race sts.

A Method of Sterilizing, and at the Same Time Impregnating with a Metal, Affected Dentinal Tissue.*

By PERCY R. HOWE, A.B., D.D.S., Boston, Mass.

(Research Laboratory of the Forsyth Dental Infirmary for Children.)

WE have found the treatment about to be described effective and of broad application, as follows:

I. It is effective in the sterilization of the disintegrated dentin overlying pulps, as in the large cavities of carious first molars.

II. By this method it is possible to completely sterilize not only a putrescent pulp without removing it, but also the dentinal structure of the root as well.

III. In acute pericementitis following the death of the pulp it is only necessary to pump this material into the pulp chamber and into the canals as well as possible and close the tooth. The pericementitis in such cases as we have treated has been quickly allayed, and a subsequent and more thorough application has apparently ended the trouble.

IV. We have found it effective in the treatment of chronic abscesses; indeed this treatment was developed largely for these special cases. The loss of the [illegible] or second molar means so much to a child that we attempted to find a simple, rapid, and effective method of treating these teeth in a large clinic.

V. We believe this to be a most admirable means of taking care of apical foramina in all cases if properly used. It is also applicable in cases where a slight apical sensitiveness exists, due to a small piece of pulp tissue left after removal of that organ during infiltrative or conductive anesthesia.

VI. It is an excellent means for almost painlessly disposing of the remaining part of a pulp after the death or removal of a portion of it. For example, it frequently happens that one root in a molar retains some degree of vitality, while the rest of the pulp is dead. This method effectually disposes of the remaining nerve shred.

VII. Applied to the root-end after apicoectomy it lessens the probability of subsequent trouble.

In all these cases this method does more than sterilize the tissue. It fills it at the same time. It permeates any affected dentin, and fills it with metallic silver in a wonderfully perfect manner.

PREPARATION OF THE MATERIAL AND METHOD OF USING IT.

Two solutions are required:

Solution 1. This consists of a saturated solution of silver nitrate in water to which is added little by little strong ammonia. As the ammonia is added a dark precipitate of silver oxid is thrown down. This is soluble in excess of ammonia, therefore continue adding the ammonia until the solution becomes clear.

Solution 2. This consists of a twenty-five per cent. solution of formalin in water.

These two solutions must be kept in separate dark-colored glass bottles, with glass stoppers, and should be away from the light as much as possible. They work better if they are freshly prepared, but are still good after a considerable time if kept as recommended.

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* The substance of this paper was presented in the form of a lecture before the Pennsylvania State Dental Society, Philadelphia, June 26, 1917.

The principle is that of silver reduction. Metallic silver is thrown down in a very finely divided state. It is deposited upon the sides of a clean test tube as a mirror. The principle is used in photography and in staining methods in histology. The action in the tooth is the same. A finely divided deposit of silver in its metallic form occurs wherever the liquid penetrates. By successive applications a very appreciable thickness of deposit occurs. This may be burnished and made to take on the luster of the metal.

The reaction in this method is as follows:

$$2AgNO_3 + 2NH_4OH = Ag_2O + 2NH_4NO_3 + H_2O$$
$$Ag_2O + CH_2O = 2Ag + HCOOH$$

Formic acid acts readily as a reducing agent, taking away O, and forming carbonic acid H_2CO_3, which decomposes easily into CO_2 and H_2O. We have then practically metallic silver and nothing else. The reaction sterilizes, as we have ascertained by repeated examinations, and at the same time leaves this heavy deposit of metallic silver in a fine state of subdivision, which penetrates all affected dentin but does not penetrate the sound tissue of the teeth.

The method of procedure is very simple. Such slight changes as are needed to make it adaptable to different localities in the mouth can readily be solved by the ingenuity of the operator. We shall describe some of these in our discussion of specific cases.

It is better to apply the rubber dam or to protect the tissues in some way. Any applicator will answer the purpose for conveying the liquids to the cavity. Broaches wrapped with cotton will serve the purpose. In the clinic here we use two pieces of glass tubing; these we prepare by heating a piece of small-bore glass tubing in the middle, and by drawing it out to a capillary. With a file this is then broken in the center. One tube we keep for the ammoniacal silver solution and the other for the formalin. If the solutions are of sufficient depth in the stock bottles, the liquid will collect in the capillary end of the tubes, or it can be drawn up into the tubes by suction. The fluid can be retained and controlled by placing the finger over the large end of the tube. Tubes with curved ends are used for the upper teeth.

A tube of solution 1 is taken, the capillary portion filled, the finger placed over the end, and this is conveyed to the cavity. By momentarily raising the finger a small drop of the silver solution is allowed to flow into the tooth. A small drop of solution 2 is now flowed in, the solution darkens, silver is reduced and is deposited upon the surface. After a few moments absorb this solution and repeat the process, in order that more silver may be reduced and deposited.

It is well to protect the hands with rubber gloves or to wear finger-cots. Throughout the treatment the silver that is deposited in the dentin is black. It is no longer silver nitrate; it is no longer formaldehyd; it is simply metallic silver that is deposited, with the formation of weak formic acid, which latter is readily converted into CO_2 and water. Sound dentinal tissue does not discolor, but any defective tissue appears jet black. Any tooth, even an anterior one, can be protected from the discoloring effects of these solutions by a coating of adhesive wax. By neatly cutting away the wax the treatment can then be applied at the point where it is indicated.

So much for general rules in the use of this treatment. More specific details will be given in the discussion of the various headings that I have given.

METHOD OF CONDUCTING BACTERIAL EXAMINATIONS.

In all cases we use the following media: Agar, glucose-agar, blood serum, and bouillon; the cultures are made aerobically and anaerobically.

In the case of dentin small bits are smeared over the solid media, and dropped into the liquid media.

In root-canals the dentinal structure is removed by a sterile bur, and the shavings dropped upon or into the media. We begin with a No. 3 bur, then use a No. 4, and so on up to No. 6. After we use a No. 6 bur the sides of the canals are lightly burred with a lower number, as No. 1. Of course in some cases the use of so large a bur as No. 6 is precluded, but the same principle is observed.

The bacterial examination of root-canal contents is made by scraping out the material with a sterile broach, excising the broach with sterile cutting-pliers, and dropping it upon the media. Sterile cotton points are introduced into the canals and then cultured.

STERILIZING DISINTEGRATED DENTIN.

(I) *It is effective in sterilizing disintegrated dentin overlying pulps.* In the course of our studies upon the bacteriology of dental caries at this institution we have found that cavities as they are ordinarily prepared for filling are not sterile. If cuts are made into the deep dentinal structure, and the material cultured, a good growth of the Moro-Tissier micro-organisms, which we have elsewhere shown to be the constant flora of caries,* is obtained. In the account of our work we have shown that this type of bacteria, and this alone, remains alive under fillings for at least six months. They are not only alive, but grow vigorously when cultivated upon laboratory media. With the dentinal tissue, then, containing bacteria, and with the bacteria capable of living under fillings, according to modern surgical principles this tissue should be sterilized even in simple cavities, while in deep cavities it is more imperative.

The study of carious tooth sections shows that the carious process penetrates much deeper than is ordinarily supposed. Particularly is this so in the molars of children. It is not practical to sterilize by means of the bur cavities that approach closely to the pulp. Is it not infinitely better not to disturb decalcified dentin, with its perfect and individual adaptation to the pulp, than it is to remove it and to attempt its substitution by a foreign material? Such a substitution can at best be only a crude and rough affair. Is not the sterilization of this tissue and its simultaneous impregnation with a metal an infinitely more therapeutic measure?

DESIRABILITY OF SAVING THE PULP WHERE POSSIBLE.

One cannot examine carious tooth sections for long without being convinced that the pulp comes early into contact with the bacteria of caries. Cavities in the molars particularly penetrate quickly to the pulp; *to* but not *into* it. The pulp has the ability to protect itself against bacteria as does other tissue, but the pulp has the further ability of recalcifying dentinal tissue. This has been practically shown, but is not yet fully understood, so that unless bacterial contact becomes an invasion, or the vitality of the pulp has become impaired, it seems reasonable to believe that the treatment we are presenting for your trial and study can act only beneficially.

Is it not better in the most extensive decay of molars to apply this treatment and to give the pulp a restorative chance than it is to immediately destroy it? I shall show farther on that the pulp is an important organ until late in life, and every effort should be made to preserve it. This is particularly so in the case of the growing child.

In the case of infection of the pulp, as in the case of many oral infections, the actual bacterial invasion must be preceded by chemical or mechanical trauma, by circulatory disturbance, by the irritations due to thermal changes, or to the conductivity of metallic fillings, by disease, by nervous disturbances, and other similar agencies. The pulp has its full share of resistance, and will respond to therapeutic measures. Wash out the cavity with Dakin's solution, then treat by the method that I am giving here, and I think that the pulp will have a fighting chance, and recover its normality if it has not been too severely injured.

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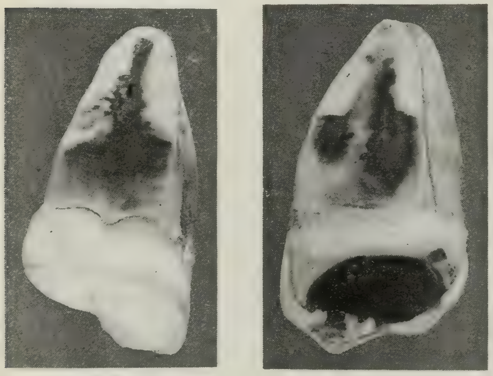
* *Journ. Med. Research,* N.S. xxxi, No. 3, pp. 481–91.

If the agitation over the blind abscess amounts to nothing more, it at least demonstrates to us that to save teeth we must begin at the beginning, and conserve dentinal tissue. It is possible to destroy a tooth mechanically as well as pathologically. It requires some skill to cut out or off any part of the anatomy. But surgery should be the last resort; it should follow only after all restorative attempts have failed. We should rely more upon therapy and less upon mechanics in all dental treatment. Cavities are rarely sterilized by the bur, as we have ascertained by careful clinical and laboratory examination, and our sections show why. It is on account of the depth of the bacterial penetration. This is particularly the case in posterior teeth. Is it not better, then, to remove as little as possible of dentin consistent with the stability of our mechanical substitutes, and sterilize this disintegrated tissue and simultaneously impregnate it with a metal like silver?

Fig. 1. Fig. 2.



These teeth were treated in the mouth and then extracted. The sides were ground off and the penetration of the silver is shown. The healthy tissue is not penetrated, but the unsound structure is.

IMPORTANCE OF PRESERVING THE FIRST MOLARS.

The removal of the four first molars from the children in a clinic of the size of this is a matter that deserves more than passing attention. A good inch taken from each arch and to the depth of half an inch in the grinding region of a child's mouth, directly under and affecting the maxillary sinuses during a growing and formative period, is a serious matter. It is serious directly to the individual, indirectly to posterity. Every dentist recommends coarse foods and mastication for tooth and jaw development and protection; so does the physician for a more extended bodily effect. Shall we reduce the masticatory surface by one-third, and at the beginning of life? We are continually dealing with cramped arches and nasal constrictions. Shall we at one operation reduce the size of the arch in a large measure?

Recall the animal experiments that demonstrate the effect of the use or lack of use of the molars upon the dental arch and the adjacent structures. The deciduous teeth upon one side of the animal's head were removed or treated so that they were not usable, while upon the other side they were not disturbed. After a few weeks the skulls of these dogs showed a striking cessation of development upon the unused side, not only of the teeth, but of the nasal passages and of the sinuses, while upon the other side a full and natural growth took place. Nasal constriction, then, follows removal of these teeth in children, and we know that full nasal breathing is of importance in general health. Statistics show that by far the most frequent tooth to decay is the first molar. For these reasons a more than ordinary attempt should be made to save these teeth, and I feel that the treatment which we have under consideration has possibilities in this direction that are superior to a mere mechanical procedure, whether the caries comes to us at its commencement or in a more advanced state. The clinical results are certainly very encouraging.

STERILIZING PUTRESCENT PULPS.

(II) *It is possible to completely sterilize a putrescent pulp without removing it.* We do not recommend this procedure, but by it it is entirely possible to leave a silver deposit in the tissue of the pulp, perhaps in the form of silver albuminate. At any rate, the pulp is sterile if the procedure is properly carried out, as we have demonstrated by repeated tests.

FIG. 3.

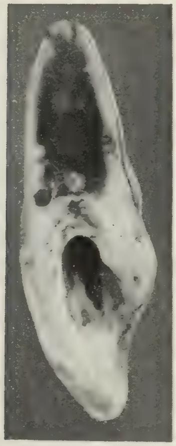


FIG. 4.

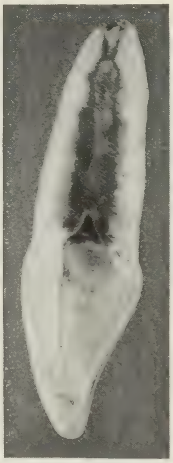
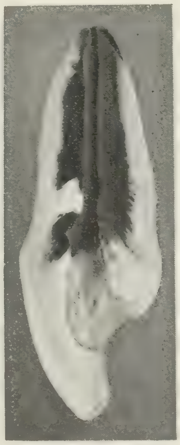


FIG. 5.



These are laboratory teeth. The tooth in Fig. 3 had five foramina; that in Fig. 4 had two foramina. All foramina are filled. Note the healthy structure in the root of the tooth in Fig. 5, just above the gum margin.

This is a safety measure, for it not infrequently happens in root-canal work that, although the instruments are sterile, the septic pulp tissue is pricked through the apices, or that the broach goes through after passing through septic root matter, thus inoculating the tissues beyond.

If upon opening a tooth that is pulpless the first procedure is to apply this method, the canal may be cleaned in safety. Indeed, it is surgically clean and more. The dentinal tissue of the root itself, of equal importance in the preservation and retention of the tooth, is not only rendered sterile, but is impregnated with metallic silver. If this treatment is thoroughly applied no further treatment is necessary, and the tooth may be immediately filled.

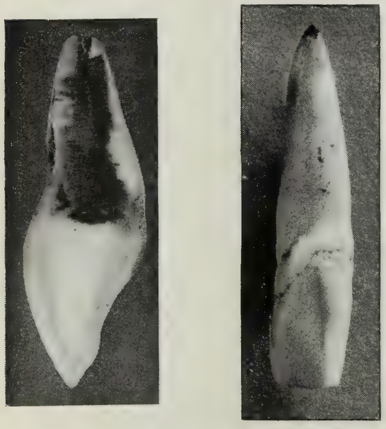
TREATING ACUTE PERICEMENTITIS FOLLOWING DEATH OF THE PULP.

(III) *When the death of the pulp is followed by acute pericementitis, it is only necessary to apply the treatment and close the tooth, when the inflammation will be promptly allayed.* It is better to see such a case a second time, for in any inflammation serous exudates occur, and they might find their way into the canal. These should be absorbed with sterile cotton points in the usual way, and the sterilization done a second time, depositing a good body of the silver in order to close the foramina. In such cases as we have had under observation this treatment has apparently ended the trouble. We have found that canals which have been treated by other methods, when treated by the method we are describing are dry, and that the small canals have been closed with the silver.

TREATING CHRONIC ABSCESS.

(IV) *We have found this treatment effective in chronic abscesses.* In the treatment of these cases we do not hesitate to work the material into the abscess itself by way of the root-canal. At no time have I seen any indication of disturbance following such a procedure, but in all cases the treatment has been markedly effective. As yet we have not had to remove any of the teeth so treated, and they have been the discards of a large clinic. Some of our efforts have not been wholly successful, but a radiograph has usually disclosed the cause, showing that we were not able to reach the abscess; but in all cases it is safe to say that there has been great improvement. This may be seen from the description of the cases that Dr. Burke has treated, which is included in this report.

FIG. 6. FIG. 7.



Showing it to be possible to use this method in anterior teeth. No discoloration of crowns.

In the use of this treatment in chronic abscesses it may be well to use as an adjunct to it some more continuous mode of sterilization. The action under this method is immediate and complete. An abscess, or an inclosed or encysted area responds curatively to ionization. Those preparations that give off formaldehyd or induce some more penetrating or continuous method of sterilization are valuable aids in such cases.

Before this is discussed further, notice from an examination of our slides what occurs in a vital tooth in an inflammatory condition of the pulp or of the pericementum, more frequently in chronic than in acute cases. Usually a so-called acute crisis is the result of a chronic condition. Long-continued irritation of the pulp, even if in a mild form, eventually results in the death of the pulp, and then comes the acute abscess, which when neglected relapses into a chronic abscess. Ground sections of teeth so affected, abscessed or pyorrhetic teeth, show distinct hyaline areas throughout the dentinal structures. This is indicative of degenerative action. In these hyaline areas the dentinal fibrils are few and far between, as shown in the illustrations. This fact, if ever noticed before, has never been enlarged upon. So, too, where pulp irritation has been of long standing the dentin is affected. While this hyaline condition of the dentin is undoubtedly a degenerative process, it is at the same time a protective one, for it stains only where the fibrils exist. Just previous to the actual hyaline state the dentin undergoes an alteration under which it stains deeply. We are extending our studies upon these internal tooth changes, and in another paper shall give a fuller account of them.

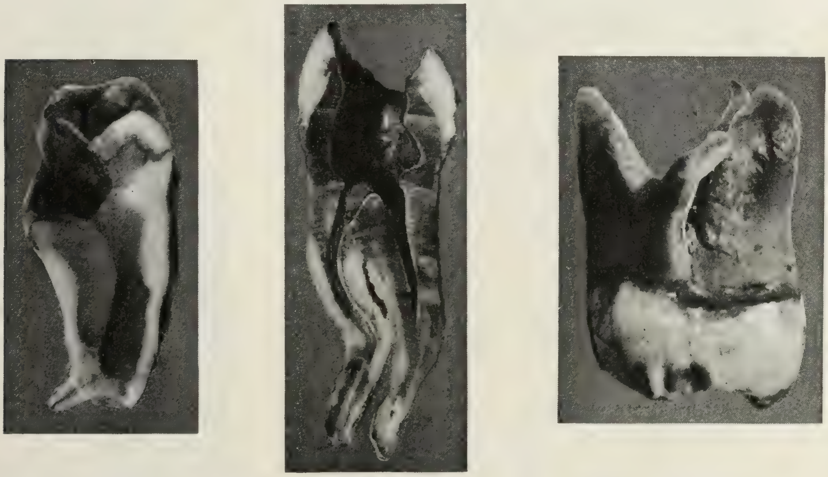
If you will examine the teeth that we have treated by this method you will see that the sound tissue is not affected, while the unsound is black with the silver impregnation. Some of these teeth were treated in the mouth and then extracted. The sound tissue seems to be unaffected. (See Figs. 1, 2, and 3.)

In practice we attempt to fill the canals of pulpless teeth—although the X-ray shows that in a large majority of cases we do not—but no or but comparatively little attention is paid to the dentinal structure. These sections show that the alteration is extensive; that the silver fills this affected dentinal structure. Our bacterial examinations show that the tissue is sterile when thus treated. Hyaline areas are sealed by nature, so that we feel we are demonstrating important facts in tooth treatment.

In the ground sections of teeth that we present here deep penetration of the tubuli is seen. A distinction must be made between the laboratory tooth and the living tooth, for the one is not vital, while the other is, and contains normal serum and moisture. It is at times possible to stain a laboratory tooth that apparently is sound, while in all the teeth we have treated and then extracted, the healthy dentin has not been stained.

From what has been said it is evident that in chronic abscesses, so far as the root-canal and dentinal tissue are concerned, this treatment is immediate and effective. When worked directly into the abscess nothing but good results have been observed so far as our studies show; but if there is a sac of serous matter it should be drained, washed with Dakin's solution, and resolution awaited before it is finally filled. Some of our investigators have endeavored to show that they cannot get an abscess sac sterile. We should hardly expect to do this clinically at one operation. We have to remember that anything that destroys the bacteria destroys the living tissue. We may wash a wound free from detritus of many kinds, we may reduce the number of bacteria by various solutions, and we may incite a healthy healing process so that shortly the wound becomes bacteria-free. This is about what we are to expect in dental abscess treatment. The forces of immunity and of resistance are fully as much to be considered as the mere presence of the bacteria. I believe that ionization is frequently an excellent accompaniment of this method that I am recommending, for it induces a healthy action in tissue, and reaches farther than we are always able to do with this treatment.

FIG. 8. FIG. 9. FIG. 10.



Illustrating the manner in which the solution finds its way to the very end of the root, even when the broach is unable to reach it.

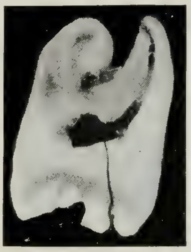
These cases should be kept under observation, and the permanent filling not too hurriedly inserted, not because of the tooth itself, for the affected tooth structure is sterile and impregnated with the silver, but on account of the abscess sac and the peridental membrane, which require a little time for return to normality.

TREATING APICAL AREAS.

(V) *Application of this treatment to the region of the apices of tooth roots.* When a pulp is removed under conductive or infiltrative anesthesia no one can say at what point it will be torn off. The elastic pulp tissue may break short of the apical foramen. There may be several foramina, and several shreds may be left. The break may occur and the elasticity of the tissue draw the point of breakage outside of and beyond the apical foramen. Any of these are annoying conditions, and a source of discomfort to the patient, frequently of long duration. The application of this treatment disposes of the first condition, and is an aid in the second.

Fig. 11.

Fig. 12.



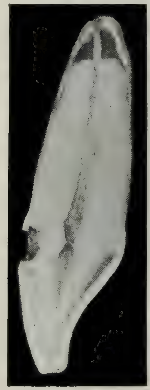
These are sound teeth from patients twenty-two and twenty-five years of age respectively. The dentinal structure is white, opaque, and uniform in appearance.

From what we may see from the ground sections in the laboratory and from the clinical evidence that we have, the treatment is ideal in any apical work. In the case of the many foramina, they are rendered sterile and are filled. One tooth with five foramina shows the silver in every one. In the case of crooked and of very fine roots the silver goes to the very end, as may be seen in the illustrations. The silver has gone through in some cases, but nothing but good effects have been observed. When penetration does occur it is not similar to the penetration of gutta-percha.

The treatment of root apices is a delicate matter, in my opinion. Examination of the tooth sections that we have prepared will show that in the teeth of the adult a limited hyaline condition very frequently exists in this region. This may be more or less extended without any noticeable pathological features. In the case of the chronic root abscesses there is an extended hyaline area, occurring not alone at the apex of the root but here and there throughout the tooth, although more especially toward the end of the root.

What the X-ray may disclose we are not prepared to say—we have not sufficiently studied this histological change; but the fact that such a change does occur should be borne in mind in interpreting the radiograph. We have seen revealed by radiography failures in attempts to fill root-canals. That these were not filled was not known by the patient or by the operator. In many such cases the tooth has been useful, comfortable, and physiologically tolerated. On the other hand we have taken out with the fingers loose teeth from about which pus was discharging, and from which an eighth of an inch of

Fig. 13.



Showing a small cervical cavity. By transmitted light the disintegrating effect may be seen reaching to the pulp. A close examination shows a dentinal alteration. The posterior portion of the tooth is affected more or less throughout its length. This may be seen along the upper part of the root. At the apex a distinct hyaline area exists, as with the sound teeth in the previous figures.

gutta-percha was protruding through the apical end of the root. We have also removed from a fistula a pellet of gutta-percha that had been forced through the root-end. Nature is wonderfully tolerant, but we can see no reason for forcing gutta-percha into tissue beyond the root-end. Such a foreign mass is only an irritant, and disturbs the natural arrangement of vessels, nerves, and tissues; it interferes with the natural circulation. The tooth at its apex is tapered, often translucent, as I have shown by sections, and the adjustment between this and the alveolus is delicate.

When there are several foramina, why should a gutta-percha point forced into the adjacent tissues an eighth of an inch, passing between all these natural connective openings, be considered a therapeutic measure? It is well to keep away from the apical region with mechanics. The treatment that we are advocating has at least some elements that are in harmony with modern biological principles. The enlarged apical ends of the developing molars of the child present no difficulties that cannot be safely remedied by this treatment, if we are to judge from the subsidence of inflammation and the return to apparently normal state that follows its use.

DESENSITIZING REMAINING PULP SHREDS.

(VI) *Disposes almost painlessly of the remaining part of a pulp after the death or removal of a portion of it.* Another place where this method is serviceable is in the case of a vital pulp shred that remains in one root-canal, while in the others the pulp is dead. These living shreds are difficult to get rid of. By this method one is able to almost painlessly dispose of this sensitive pulp tissue. If slight pain is felt when the ammoniacal silver nitrate is applied, follow it immediately with formalin, working it down the root-canal, when the pain will cease. Pressure with a rubber pellet is sometimes a very good way to force the liquid down the canal; the pulp will be sterile and stiff with the impregnation of the silver.

FIG. 14.

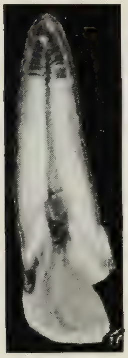


FIG. 15.

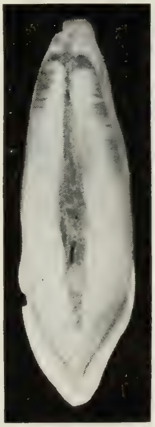


FIG. 16.

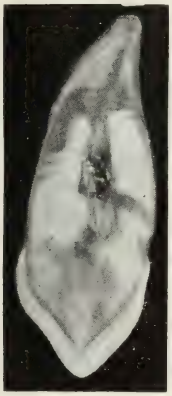


FIG. 14. Note the cavity extending to the pulp. Note dentinal alteration, also the hyaline condition at the apex. This tooth had abscessed.

FIGS. 15, 16. These show a similar dentinal alteration. The teeth were firm in the jaw, but were removed with others.

USE OF SILVER NITRATE SOLUTION FOLLOWING APICOECTOMY.

(VII) *A still further application of the principle of dentinal tissue impreg-*

nation in the treatment of the tooth stub after apicoectomy. Dr. Shuman, after examining the tooth sections and the effect of this method in other cases, applied it following apicoectomy for the purpose of sterilizing the remaining dentin and sealing it against serous exudates following the operation, and reports that he has had no trouble since its use. Previous to its use an occasional swelling would occur some time after the operation.

FIG. 17.

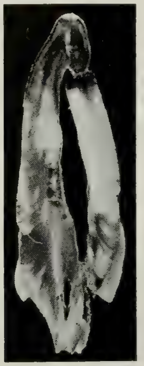


FIG. 18.

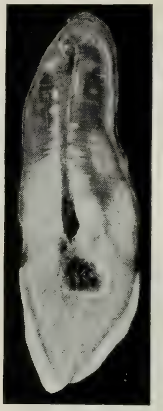


FIG. 19.

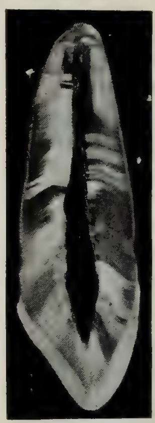


Fig. 17 shows abscessed tooth in which the crown was broken in grinding. Figs. 18 and 19 show pyorrhetic teeth. Note in Fig. 19 that both the pulp and the pericementum have taken part in this dentinal change.

FIG. 20.

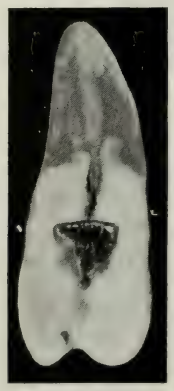


FIG. 21.

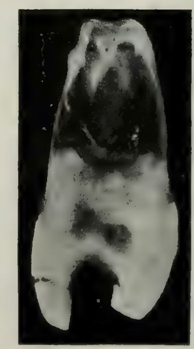
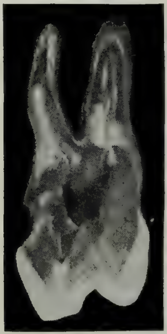


FIG. 22.



Showing localized areas where the dentin has become completely hyaline, with no dentinal fibrils to be seen. These areas will not take stain. They are absolutely sealed.

There are questions that naturally arise in the consideration of this method, some of which we shall attempt to answer here. One of the first that occurs is, Does this treatment discolor the teeth? It renders them jet black wherever the silver deposition takes place. This is certainly an objection to its use, and limits its employment. It will enter any defective tooth structure, but does not seem to penetrate sound tissue, as we have said.

The method was evolved particularly to save posterior teeth, the first molars especially, nearly all of which are affected in a large clinic like the one at this institution. The treatment had to be prompt, simple, and efficacious—and so far it seems very successful. Here the color did not matter so much, but breadth of application was needed, and we have therefore worked out the following method for treatment of anterior teeth. The root-canal is enlarged to well below the gum margin. The entire tooth is coated with adhesive wax, and the enlarged part of the canal is filled with it. With a cold wet instrument the wax is punctured in a line with the apical end of the root-canal. The canal is cleaned with a barbed broach and the silver solutions applied. After treatment the apical portion of the root is filled by any method chosen, any remaining silver being wiped out, and the wax removed. This prevents discoloration of the lower part of the canal or the crown. It is best to practice this procedure in the laboratory before trying it on the patient.

FIG. 23.

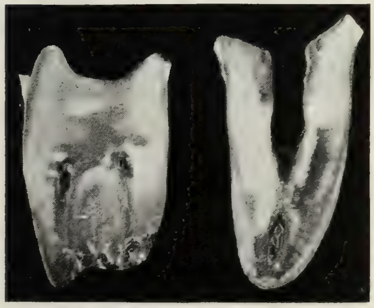
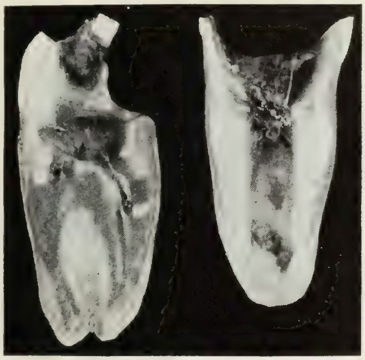


FIG. 24.



Showing abscessed roots of children's sixth-year molars. These teeth were firm, but had a history of swelling, and were inflamed at the time of extraction.

TOLERANCE OF THE TISSUES FOR THE SILVER SOLUTION.

Another question that arises is that of tissue tolerance. It is a well-known fact that silver in its metallic form has been used in different parts of the body, and that it is tolerated by the tissues. We have shown that when it is passed outside of the apical foramen it has not increased inflammation, but allayed it.

We have in our collection a molar that is dark with silver stain throughout its entire root substance! This tooth was firm in its socket, a piece of alveolus being removed with it in its extraction. The tissues around it were pink and healthy. The majority of the remaining teeth were loose and diseased, and for this reason were removed. One occasionally sees a tooth filled with coin amalgam that has outlasted modern work.

Silver nitrate has long been used in dentistry to allay sensitiveness and to arrest decay. It has been used electrolytically in abscess treatment. Dr. Prinz's book contains an excellent exposition of the subject. Silver tartrate and silver citrate have been recommended for wound treatment. Dilute silver nitrate is used for an eyewash for infants. Argyrol is of wide use. It is reasonable to conclude that silver is not only tolerated by the tissues, but that it is a valuable therapeutic agent. In presenting this method of sterilizing and at the same time impregnating affected dentinal tissue, we wish to state that we still consider the work experimental. Whether it is original or not is a matter of no moment. So far as we know it is, and we believe it is founded on sound principles. If it is ever good practice to sterilize and fill tooth tissue it may be done in this manner simply, effectively, and perfectly.

We do not hesitate to recommend it for trial. It is natural to expect some failures, particularly until the technique is mastered. In the hands of the dental practitioner this will be readily accomplished, and undoubtedly many helpful suggestions will be made.

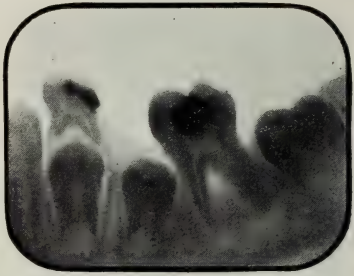
If there is anything to be added in the way of caution in the employment of this method, it is to remember the distinction between dentinal tissue and the cellular tissue beyond the root-end. While the silver does no harm in the diseased cellular tissue, and is indeed beneficial, it is at times slightly irritating for a short period. On the whole, we believe that it is the best practice to first use Dakin's solution in this tissue, and confine the action of the silver solution to the dentinal tissue as much as possible. Should this not prove effective, work the silver solution directly into the abscessed tissue. No serous discharge ever follows. The tooth is always dry, and it is sterile. A little experience and a little judgment is all that is necessary.

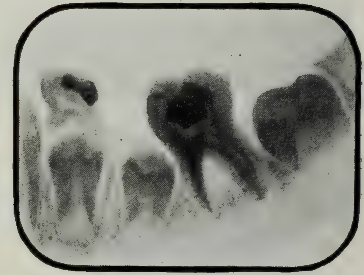
Preliminary Report of Cases.

The following is a preliminary report of cases by Dr. Burke. He has many other cases he has treated, which he will make the subject of a subsequent report. Many more are being daily treated in this manner by other operators in our clinic, an account of which will be given later.

Case 1. Lower right first molar. Pulp had died under an amalgam filling. There was considerable pain and some swelling, the X-ray showing an abscessed area at the apices of the roots. (See A.)

Ammoniacal silver nitrate and formalin was applied in the canals, and cultures taken from the canals, which showed no growth. The tooth was then sealed up with cotton and gutta-percha. The X-ray showed a deposit of metallic silver along the walls of the canals and the pulp chamber. (See B.)


A


B

Case 1.

The treatment was repeated one week later; there had been no pain after the first sitting, and the swelling was reduced.

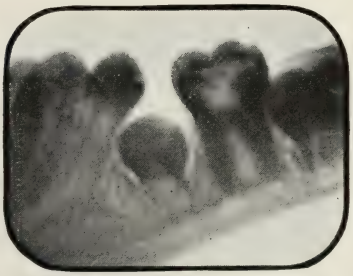
Case 2. Lower right first molar. Patient eleven years of age. X-ray taken before treatment, June 8, 1917. (See A.)

The mesial canals were putrescent; the pulp in the distal canal was vital, with a history of pain. Ammoniacal silver nitrate in solution was introduced into the canals, pumped down with a smooth broach, and reduced with formalin. The tooth was sealed with gutta-percha.

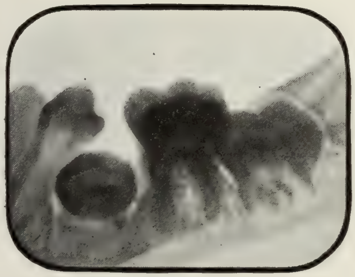
On June 22d, patient returned for further treatment. There had been no pain or odor. The treatment was repeated.

On June 29th an X-ray (see B) was made before filling the canals, showing deposit of metallic silver along the walls of the canal and the pulp chamber. The canals were filled with zinc oxid, aristol, and eugenol solution, plus gutta-percha points.

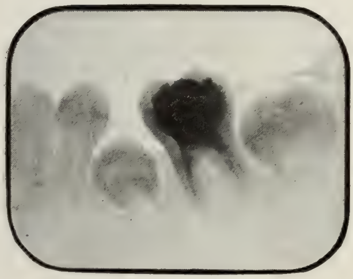
On July 6th an X-ray (see C) showed the canals filled.



A



B



C

Case 2.

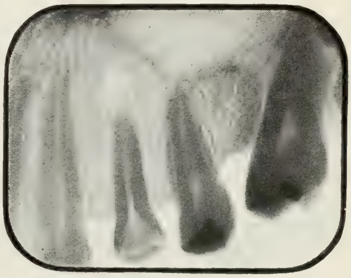
Case 3. Upper right first bicuspid—X-ray taken before treatment (see A)—containing a putrescent pulp, with a very foul odor.

One or two drops of the silver nitrate solution were applied in the pulp chamber of the tooth, and gently worked into the canals with a smooth broach. One drop of a 25 per cent. solution of formalin was then added to reduce the silver nitrate.

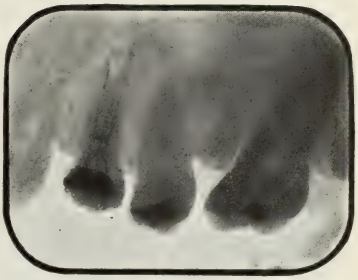
A radiograph (B) shows the deposit of the metallic silver along the walls of the pulp chamber and root-canals.

Cultures taken from the dentin of the canals showed no growth.

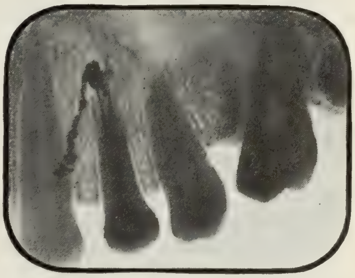
A radiograph (C) shows the canals filled.



A



B



C

Case 3.

Case 4. Lower right first molar, in which an attempt had been made to remove the pulp with novocain at some previous time. I found the mesial canals putrescent and the pulp in the distal canal vital.

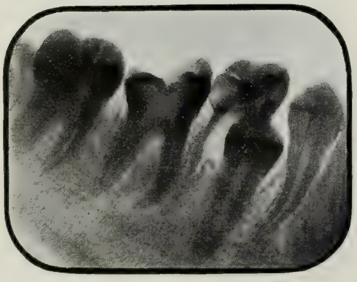
Silver nitrate was introduced into the canals by applying a drop or two in the pulp chamber and then working it into the canals with a smooth broach. This solution was reduced in the tooth by adding one drop of a 25 per cent. formalin solution.

The canals were then filled with a paste of zinc oxid, aristol, and eugenol, and gutta-percha points.

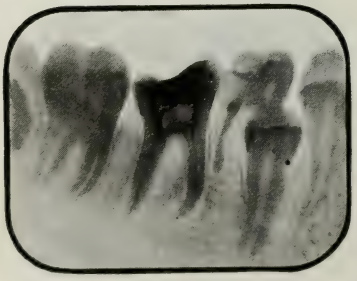
Case 5. A lower left second molar in which the pulp had died under an old copper amalgam filling. There was the usual foul odor accompanying such a condition.

The solution of silver nitrate was introduced into the canals, and reduced with the solution of formalin, and the tooth sealed with sterile cotton and gutta-percha.

Case 6. Lower left first molar of a patient twelve years of age. A radiograph (see A) shows the case before treatment, June 2, 1917. There was present a putrescent pulp with a history of pain and swelling.



A



B

Case 6.

An ammoniacal solution of silver nitrate was introduced into the canal, pumped down with a smooth broach, and reduced with a 25 per cent. solution of formalin.

The tooth was sealed with cotton and gutta-percha. A radiograph taken June 9th (see B) shows the deposit of the metallic silver along the walls of the canals and pulp chamber. Cultures taken from the canals were negative.

The canals were filled with a paste of zinc oxid, eugenol, and aristol, plus gutta-percha points.

Case 7. A lower right first molar which had previously been treated with phenol and formocresol, etc., but finally presented with a slightly foul odor.

Silver nitrate and formalin were applied in the canals and cultures taken were negative. They were immediately filled with zinc oxid, aristol, and eugenol paste, plus gutta-percha points, with no subsequent trouble.

Case 8. Upper left first molar which had abscessed and was loose and aching, with considerable swelling.

Silver nitrate and formalin were applied. The tooth was so sore that it was impossible to apply the rubber dam. The patient returned the next day, when the swelling was still present, though no pain accompanied it.

The tooth was again treated with formalin and silver nitrate and sealed up with cotton and gutta-percha. The patient presented herself three days later, at which time the swelling was completely reduced and there was no pain; tooth firm.

The tooth was examined two months later. The gum about the tooth was pink and healthy, the tooth firm, and there had been no pain or discomfort since the treatment.

Case 9. A lower right first molar which had been long treated and was very uncomfortable to the patient. Examination showed hypertrophied pulp tissue filling all the canals. Ammoniacal silver nitrate solution was gently worked into the canals and reduced with formalin. As the hour was late, a filling of zinc oxid and eugenol was inserted, and patient seen on the following morning. No vital pulp in any of the canals; tooth dry and sterile. This tooth was then filled in the usual manner, with no subsequent trouble.

Case 10. A lower left first molar with vital pulp left in the root tips after attempted removal under conductive anesthesia. This tooth had been a source of discomfort to the patient for three months. The tooth was treated according to the method described and filled at once, with no further trouble.

10 EXETER ST.

Nutrition and the Development of Teeth.

By L. T. ROYSTER, M.D., Norfolk, Va.

(Read before the Virginia State Dental Association, Norfolk, Va., April 18, 1917.)

Mr. President, and gentlemen of the Virginia State Dental Association,—When I accepted your invitation to read a paper on this subject I did not realize how difficult the task would be. It is the more difficult because of the fact there is so little recent literature on this subject.

The growth of the human organism is dependent on what we call "nutrition," that is, the relation between food intake and its assimilation. There are two distinct periods of nutrition, the prenatal and the postnatal. The prenatal period may be divided into two divisions, the time prior to conception and the period *in utero.* Before the period of conception the health of the parents is to a large extent the governing factor in the health of the future child; upon their health depends to a large degree the state of health of the child.

The two principal diseases to be considered at this time are syphilis and tuberculosis. Syphilis may be directly transmitted to the offspring, while tuberculosis is rarely so. But it is a well-known fact that a tuberculous mother has her own health so much impaired that she is apt to bring forth a weakling. There are other diseases existing in parents which might be considered, but for the time allotted for a paper of this nature, these two must suffice.

At the moment of conception the influence of the father's health practically ceases; not so that of the mother, as on her condition the nutrition of the child depends for the entire period of gestation. In many respects this period in the child's life is the most important. Women who are compelled to work up to the time of the birth of the child bring forth noticeably weak children, while active tuberculosis so affects the health of the mother and the resistance of the offspring as to be considered by many authorities as an indication for the interruption of pregnancy.

Among the poor and in time of distress, notably in time of war, the nutrition of the child-bearing mother falls very low, with the consequence that the offspring is born into the world seriously handicapped by a state of lowered resistance. So much is this the case that France is today suffering from the effects of privation during the Napoleonic period.

During the period of gestation the infant depends entirely upon the food derived from the blood stream of the mother. After the birth of the child nutrition may be divided into two periods, the period during which liquid food is taken and that in which mixed or solid food constitutes the diet. On all these conditions depends the development of the deciduous, and perhaps of the permanent teeth also.

As has been stated, nutrition is the relation between the food intake and its assimilation. This assimilation takes place as the result of two forms of digestion, the alimentary and the parenteral. The former occurs in the stomach and intestines—the so-called digestive tract—while the parenteral digestion takes place within the tissues. It is only during very recent years that the importance of parenteral digestion has been appreciated, but in many respects it is the more important. Both of these digestions are dependent on a variety of influences too large to be considered on this occasion.

It is obvious that the first prerequisite to assimilation is proper and assimilable food. By "proper food" I mean such articles of food as contain the necessary elements to build up the various bodily tissues. Of course this food must be ingested in such a manner that the body can most easily and readily assimilate it. The other prerequisite is that there must be a state of health which will permit of assimilation. For convenience I shall take up the second proposition first.

There are certain conditions of the body which for want of a better term we call diseases of nutrition. There are other distinct diseases, infectious and otherwise, which so lower the activities of the body functions as to render assimilation of food difficult or even impossible, notably scurvy, rhachitis, syphilis, and disturbance of the functions of the glands of internal secretion—the so-called endocrine system.

The systematic study of the endocrine system is a matter of such recent date that we have not had time to draw any definite conclusions therefrom. Excessive activity of the normal functions of some of these glands lowers vitality, while pathological diminution of others seems to stimulate growth and development. This leads us to the inevitable conclusion that these glands complement growth and development in some instances and antagonize them in others. So, although we possess little accurate knowledge, yet we look to the study of these glands for a revolutionary knowledge of the growth and development of the human organism. It is to be presumed that much of this will relate to the bone structure in teeth as well as other matters.

Coming more particularly to the subject which no doubt interests us most on this occasion, we will review our knowledge as to the development of teeth. As we all know, there are normally two sets of teeth, the first being temporary and the second permanent. The average age for the beginning of eruption of the deciduous teeth is from six to nine months. This, however, is but an average, deduced from observation of a very large number of children; there are wide limits of variation, even among apparently normal children. The character and the amount of food, as well as certain familiar diseases, no doubt exercise potent influences in the variation of the time of eruption, in the determination of decay, and in the irregularity of shape and structure of the teeth. The conditions other than nutritional which appear to influence these matters are about as follows:

As a rule the eruption of the deciduous teeth is much delayed in rhachitis. This is probably because this disease is caused by environmental conditions, bad housing generally, rather than actual nutrition. It is a notable fact that many rhachitic children are fat and apparently well developed, and while the characteristic deformities of rhachitis are found in the bony structures, the teeth are usually well formed and well developed.

Syphilis furnishes us with a rather remarkable example of the influence of disease on tooth development. Eruption of the teeth in this disease is usually early, as is the closure of the fontanel. In fact, the closure of the fontanel and the eruption of the teeth usually follow the same rule as to time. These early erupted deciduous teeth are also prone to early decay, while many times the permanent teeth are of the Hutchinson type or show other malformations. A typical Hutchinson tooth, however, is exceedingly uncommon, when we consider the number of positive Wassermann reactions found among large clinical material.

The most delayed eruption of the deciduous teeth is in the case of cretinism, which, as you are aware, is a state of disturbance of the thyroid gland which acts on the general system as well as impairs the mentality. This is the most striking illustration that we have at the present moment of the effects of disturbances of the organs of internal secretion. Impaired mental states generally have their direct influence on the bodily functions, yet much of this is due to disturbed activity of the glands of internal secretion, about which we have yet so much to learn.

EFFECT OF THE CHARACTER OF FOOD ON ERUPTION.

This brings us directly to a consideration of the character and amount of food required by the growing organism.

Nature has supplied the child with the food which is best suited to its needs, the breast milk of the mother. Generally speaking, breast-fed babies erupt their teeth somewhat earlier than those artificially fed. It is not uncommon for breast-fed babies to commence teething at three months, nor is it uncommon for artificially-fed infants to commence as late as nine or ten months. This may occur in those artificially fed by the most approved methods, which demonstrates that however carefully and scientifically cow's milk is modified to conform to the needs of the growing child, it does not exactly fill the requirements. Children fed on the prepared foods of commerce, especially those which are not mixed with cow's milk, are usually noticeably late in erupting their teeth.

It is best to have the mother nurse the baby during the greater part of its early life. Delicate infants require that nursing be kept up for a longer period than the robust. It is better for strong and healthy infants to receive solid food some time during the last quarter of the first year in addition to the mother's milk. which should be supplanted by solid food by the twelfth month. Unfortunately, many mothers cannot nurse their babies during all of this period. It is in this class of cases that we must be most careful.

Regardless of the fact that all food elements which go to make up the bony structures, especially the lime salts, are contained in the mother's milk, chemical analysis shows a very small percentage of these salts. The most important age in feeding, therefore, is that period during which the permanent teeth are forming at the roots of the deciduous ones. In those instances where mothers are unable to nurse their babies for any protracted period it becomes necessary to furnish a substitute. It is highly important, then, that this be done promptly. The mistake is more often made of giving too strong a food to begin with at this period than a food which is too weak. However, one cannot too strongly emphasize the importance of not keeping the child on a weak formula for an unnecessary period of time. The most approved methods are simple dilutions of whole milk or a mixture of cream, skimmed milk, and water, with the necessary amount of milk or malt sugar.

Toward the end of the first year and during the whole of the second year we must change from liquid foods, rich in fats, carbohydrates, and proteids, to those which contain more organic salts than do fats and proteids; in other words, largely carbohydrates in combination with organic lime salts. All the lime salts necessary for bone development are present in the vegetable kingdom, in which form they can be assimilated with more readiness than are inorganic salts administered as such.

During this transition period the fruit juices are essential as well as desirable. The white potato furnishes us with the best potash salts of any food which has as yet been found, and that particular part of the potato known as the cortex, which is found immediately beneath the jacket, is the most valuable part, while carrots, spinach, kale, and turnip tops are next in value.

Sugar is of great value in the dietary as a heat producer, but since all forms of carbohydrates are transformed in the process of digestion into sugar, the child secures enough of this product when it is used only as a simple sweetener, without any addition in the form of candy.

It will be readily seen from what I have said that nutrition which bears directly on the formation of the teeth is merely that which is necessary for the body generally. All food must be furnished rationally. Directions as to food are simplified by knowledge of the underlying fundamental facts. These have been hinted at only in my remarks, but enough has been said to cause a thinking individual to act intelligently.

To recapitulate, then, parents should be healthy before they assume the rôle of parenthood. During the nine months of gestation the mother's health, exercise, and food should be looked after with zealous care. After the birth of the infant all mothers should be induced, as far as their physical condition will permit, to nurse their offspring. When this is impossible, modifications of cow's milk are best. After the weaning period simple, wholesome, and easily-digested foods are to be preferred to the fancy articles of diet. Add to this an abundance of fresh air at all seasons of the year, and we are more than likely to have easy dentition and well-formed teeth, which with a reasonable amount of care, need almost never decay.

TAYLOR BLDG.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

◆

CORRESPONDENCE

"Novocain Conductive Anesthesia in Exodontia."

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—In closing the discussion of Dr. Duffield's paper, Dr. R. H. Riethmüller replied to Dr. Cryer by taking issue with my method for anesthetizing the teeth of the superior maxilla. He says in part:

> "Neither the posterior superior alveolar nor the infra-orbital nerve runs through Meckel's ganglion. It is from the maxillary or alveolar nerve that a branch, the palatine, is given off through Meckel's ganglion. Stern is wrong in attempting to reach Meckel's ganglion," etc. (COSMOS, July 1917, p. 749.)

From these remarks it is evident that Riethmüller is in error regarding my purpose in approaching the maxillary nerve at a point near the ganglion. The main object of the injection as outlined in my original article is to block the alveolar nerve in the vicinity of its junction with the parent branch (the maxillary nerve) in the spheno-maxillary fossa. My critic's confusion arose perhaps because an incidental advantage of this injection was suggested in the fact that a perineural anesthesia of Meckel's ganglion could be obtained at the same time, thereby eliminating the necessity for the usual palatal injections. However, it was then specifically explained that anesthesia of the ganglion was desirable for the purpose of blocking sensory communication in the *descending palatine* branches. (COSMOS, January 1916).

I must also differ with Riethmüller when he declares that the only satisfactory approach to Meckel's ganglion is through the dangerous route of the posterior palatine foramen. The effectiveness of the technique advocated by myself for obtaining anesthesia of molars and bicuspids is attested by the uniform success obtained in over 1500 cases in my own practice, as well as by the fact that the spheno-maxillary injection is used and approved by numbers of practitioners throughout the country.

LEO STERN, D.D.S.

NEW YORK, N. Y., July 26, 1917.

"Possibility of Deception in Compared Radiographs."

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—In reply to Dr. Albray's criticism of the roentgenograms published by me in the DENTAL COSMOS for April 1917, showing regeneration of bone about teeth which have been *properly* treated for pyorrhea, I desire to call attention to a fact which I had supposed was pretty generally recognized, viz, that correct reading of roentgenograms cannot safely be made by one unfamiliar with the clinical history of the case.

I freely admit that the roentgenograms as published are not conclusive, and were they not confirmed by abundant clinical evidence they might be disregarded. They certainly could not be expected to carry conviction to one suffering from the delusion that pyorrhea is an incurable disease, as he would be blinded to the truth by his own failures. Confirmatory clinical evidence, however, is not wanting in the case referred to. In this particular case the best evidence that bone regeneration has taken place is not to be found in the roentgenograms but in the complete restoration to health of the tissues involved. A tooth so loose that it could have been extracted with the thumb and finger, with pockets extending almost to the apex on all surfaces of the root, abundant pus discharge, and every symptom of advanced pyorrhea, has become firm in its socket, with complete obliteration of pockets, and with a healthy condition re-established in the gums. The present rigidity of the tooth would not, in my opinion, be possible without bone regeneration. Similar results are obtained in practically all cases treated as they are by successful practitioners of periodontia everywhere. These are not expressions of opinion; they are demonstrable facts. No one's statement need be taken for them. If Dr. Albray really wants to know the truth and will take the trouble to come to my office I shall be pleased to submit to him any number of cases in confirmation of the above statements.

Respectfully yours,

PAUL R. STILLMAN.

NEW YORK, N. Y.

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Virginia State Dental Association.

Forty-eighth Annual Session, held at Norfolk, Va., April 17, 18, and 19, 1917.

(Continued from page 822.)

WEDNESDAY—*Morning Session.*

The meeting was called to order Wednesday, April 18th, by the president, at 9.50 A.M.

Dr. MANNING called for reports from the various committees.

Dr. GIFFORD, chairman of the Entertainment Committee, called attention to the dinner to be given at the Fairfax Hotel in the evening, and to the ladies' luncheon at the Country Club, Thursday, at 1 o'clock.

Dr. W. H. HALLER, chairman of the Committee of Anatomy, Histology, and Physiology, said this committee had no report to make, as he had been informed that the program would be filled by voluntary and other contributions.

Dr. W. H. PEARSON, chairman of the Committee on Clinics, said this committee had no report to make except the printed program. He wished to thank the gentlemen who had helped in arranging the program.

Dr. Manning then introduced Dr. RUPERT E. HALL of Houston, Texas, who gave a lecture and demonstration on Prosthesis.

Dr. Hall's lecture consisted of a demonstration of his method of taking impressions with plaster, and the making of a denture with the aid of the Hall articulator.

Dr. J. H. COSTENBADER, chairman of the Membership Committee, read a list of applicants for membership and reinstatement, with their indorsers.

The society then adjourned until the afternoon session.

Afternoon Session.

The meeting was called to order by the president at 2.30 P.M.

Dr. Manning called for further committee reports, and Dr. HARPER, as chairman of the Committee on Operative Dentistry and Ceramics, stated that he had had the promise of a clinic by Dr. W. H. Mosely of South Boston, who, owing to the illness of his wife with typhoid fever, was unable to be present.

The report of the Committee on Oral Hygiene was then presented by the chairman, Dr. J. M. LEWIS.

Dr. HARRY BEAR made a motion that the chairman of the Oral Hygiene Committee be authorized to expend one hundred dollars during the coming year for the purchase of a lantern and slides. The motion was seconded and carried.

Dr. J. P. STIFF of Fredericksburg presented the report from the State Board of Dental Examiners.

Dr. W. M. STURGIS, treasurer, read his report, which was adopted as read.

The next item on the program as announced by the President was a paper by Dr. R. R. BYRNES, Richmond, Va., entitled "The Principles of Black's Cavity Preparation."

[This paper will be published in the next issue of the DENTAL COSMOS.—ED.]

ELECTION OF OFFICERS.

The next order of business was the election of officers for the ensuing year, which resulted as follows:

President—Dr. W. H. Pearson, Norfolk.

Vice-president—Dr. S. B. Ward, Belle Haven.

Recording Secretary—Dr. Geo. F. Keesee, Richmond.

Assistant Recording Secretary—Dr. Harry Bear, Richmond.

Corresponding Secretary—Dr. F. R. Talley, Petersburg.

Treasurer—Dr. W. M. Sturgis, Marshall.

Executive Committee—Dr. B. T. Blackwell, Richmond, Chairman; Dr. C. W. Beauchamp, Charlottesville; Dr. J. M. Hughes, Richmond.

The next matter considered was the time and place of the next meeting. Dr. R. L. SIMPSON, Richmond, chairman of the committee appointed at the last session to report on the matter of holding a tri-state meeting with Maryland and the District of Columbia, reported that Maryland and the District of Columbia had appointed committees to confer with Virginia about a joint meeting, without knowing that the Virginia society had taken a similar action. He had seen these committees two weeks previously, and had found them enthusiastic about having a meeting in Baltimore in June. The majority of the members of the Virginia society that he had consulted, however, thought it unwise to hold such a meeting so soon after their own state meeting. He recommended that the committee be continued or another appointed to arrange for holding a meeting in the following year jointly with the District of Columbia, Maryland, and North Carolina.

Dr. CAMPBELL moved that, in view of the conditions obtaining, the meeting with the other associations be postponed until 1918. (Motion carried.)

Dr. PILCHER made a motion that the election of nominees to be recommended to the Governor for membership on the state board be the first order of business for the following afternoon at 2 o'clock.

The meeting then adjourned until the evening session.

Evening Session.

The meeting was called to order by Dr. Manning, at 8.10 P.M.

Motion was made and carried that the visitors present be extended the privileges of the floor.

The first paper of the evening was that of Dr. L. T. ROYSTER of Norfolk, entitled "Nutrition and the Development of Teeth."

[This paper is printed in full at page 905 of the present issue of the COSMOS.]

DISCUSSION.

Dr. F. R. Talley, Petersburg. There is one point in the paper that struck me forcibly, and that is the consumption of sweets by children. It is hard to keep mothers from giving children sweets. I do not believe they should have marmalades, jams, preserves, etc., at the evening meal, but if they will persist in eating these things, something should be done to balance up the diet in such a way as to eliminate some of its evil effects. From what I can gather from reading along this line, the apple seems to be generally accepted as one of the best things to balance up, in a way, the effects in the mouth, particularly the effects of the sweet things I have mentioned. If, before the child goes to bed, he is given an apple to eat, we find that it does two things, at least: First, the apple is one of the best natural cleansers of the teeth that a child could eat; it has some power of friction, along with the acid condition, dissolving part of the deposit on the teeth left by the sweets. Second, it stimulates the salivary glands, increasing the flow of the saliva, which we know is the normal way of maintaining alkaline reaction in the mouth. We cannot expect mouthwashes or anything else to do in the mouth what some people claim they will do in the test tube, because the mouth has practically a river of saliva flowing in all the time. So you cannot expect a wash that will kill bacteria in the test tube to do it in the mouth in the same proportion. We must depend on the stimulation of the salivary glands; the apple effects this stimulation, not only at the time of eating but throughout the sleeping-time of the child. I think this is one of the best simple things we can do. If we cannot stop the eating of sweets at night, we should give something to offset the condition produced.

Too few are paying enough attention to the teeth of children. The day has come, in fact is past, when we ought to have a dentist whose specialty is to work on children's teeth alone. The field is broad and urgent. We do not get children early enough. We cannot get at the parents, and men like Dr. Royster, with the *entrée* into the homes of the people, have the greatest opportunity of any class of men to stimulate enthusiasm in regard to the necessity for prophylactic work and the filling of small cavities for children. When this is done we are going to get the teeth in good condition. Frequently, because of exposed pulps and tender gums, the child swallows food in bulk, which sets up fermentation, and we get an acid reaction in the mouth which destroys the teeth.

The remedy is early attention and constant supervision.

Dr. J. A. Reese, Lynchburg. I beg the association's pardon for harping on the subject, but you will remember that at a meeting in Old Point I read a paper on the "Evil Effects of Odontalgia," and made this plea—That we go back and have the mothers eat more of the foods that contain calcium phosphate. The mother may be fed with these foods, and be able to supply true phosphate material to build up the system of the child, not only before birth, but during the nursing period.

Dr. L. M. Cowardin, Hot Springs, Va. As I said last night, an ounce of prevention is worth a pound of cure. Dr. Royster in his line is doing much to control disease. Also he and the other practitioners of medicine who have family practices have control of the children in ways that we cannot have; therefore the burden falls at that period on the physician. The children should be taught that it is the decay of food which gives rise to caries. We should impress upon the mother the importance of regular feeding and of requiring the child to abstain from foods during certain hours, because the mouth and the stomach, like everything else in the body, need rest. If this is not given, the mouth will never be clean. You may use the toothbrush as much as you like, and the result will not be a clean mouth. I had a family in which there were five daughters who came to me every six months. Their mouths were always clean. They had from four to eight fillings inserted every six months, I believe due to the fact that they were eating almost constantly, and especially eating fruit at night. I had other mouths that did not need one filling a year.

The worst cases that I ever had to prescribe for were those in which the persons ate fruit at night, especially bananas. We must educate the medical profession to the fact that we can, without assistance, prevent these conditions by regulating the diet. Dr. Gobie is doing an excellent work, but it is in the way of the pound of cure instead of the ounce of prevention. If we teach the mothers properly, we will not have so much work to do in caring for the teeth afterward.

Dr. W. A. Gobie, Boston, Mass. I should like to answer Dr. Cowardin. There are one or two things in the way of prevention in children that we could do if we could have an early start; but it is hard to reach the parents. Even if we did, we should have to be able to speak a dozen languages. The children who come to us are very seldom brought by their parents, because most of our work comes through the school nurse. As soon as the examination is made we have the teeth properly cleansed. The child is shown the right way to brush the teeth. Each time he comes after that, the first thing we do is to see whether the teeth have been properly brushed. If they have not, we allow the child only two or three further visits at the institution, and then, if he still does not brush his teeth as he should, he is dismissed. We kept an accurate record of over six hundred cases, and out of these only eight were dismissed for not properly brushing their teeth. Of these eight children, the majority begged to be taken back into the institution. I think that a great deal can be done in the way of helping the mother, but we cannot always blame the parents for these things. The first thing we do when a new child is brought into the ward is to feed it lime salts. That is something for the physician to know. We are helping the physicians in research work, and they ought to help us a little.

Dr. Royster (closing the discussion.) I want to speak of the school clinic question. I was for twelve years on the school board of this city. We tried, during these twelve years, with all the political influence we could get together, to obtain school dental clinics. I believe it will be included in the appropriation for this year.

With regard to extractions, this subject does not belong to my paper at all. You will pardon me for saying it, but I have a great deal to do with decayed teeth, and have the hardest time to get my dental friends to extract a tooth. The idea seems to prevail among dentists that a deciduous tooth must not be extracted while the permanent tooth is forming. The statistics show, however, that unless a tooth can be cleaned, and a temporary filling put in, it is a pathological condition, and the tooth is better out regardless of what is forming at the base. I think that allowing this decayed tooth to remain will have a worse effect on the tooth forming at the roots than any orthodontic condition that might result from its removal.

In regard to sugar, I do not know whether it impairs teeth; but it impairs digestion, and that in time impairs the development of the teeth. I try to get parents not to give candy to their children until they are five years of age. They say, "The children love it so." Well, how do they learn to love it?

With regard to prenatal care, that is not entirely the physician's business. The vast majority of pregnant women have to go to the dentist, and then is the dentist's opportunity to tell them to take care of their bodies so that their children will have sound teeth. There is not enough co-operation between the two professions. Whenever there is co-operation between them, success will come. If we study the question together and help each other out, something is going to happen. The best investment for any town or any city in any country is a school nurse. Other things are secondary to that, because a school nurse is a social worker, and will bring the cases to the dental clinics and the hospitals.

We do not know quite enough yet about many things, and are just beginning to learn something about the various influences on the development of teeth.

In regard to educating the public, I am a believer in popular lectures, but it is hard to get the people to attend them. The poor will go, but the better classes feel that it is beneath their dignity.

Dr. Wm. A. Gobie, of the Forsyth Dental Infirmary of Boston, spoke of the work being done in the institution for the school children of Boston, outlining its purposes and aims in the effort to care for the teeth of the children, and to educate the public in the importance of proper care of the teeth.

Dr. Gobie also spoke of the advantages being offered to young men just coming out of college of spending a year as an intern in that institution. The intern is paid one thousand dollars a year and furnished with linen and instruments for doing his work, and what he could learn in the year spent at Forsyth Infirmary was well worth the expenditure of this time.

The next paper presented was by Dr. J. A. C. HOGGAN of Richmond, entitled "Technique of Orthodontia Treatment at a Distance."

[This paper will be published in a later issue of the DENTAL COSMOS.]

Dr. Manning announced the appointment of Dr. H. Wood Campbell of Suffolk and Dr. W. H. Street of Richmond as delegates to the National Dental Association, with Dr. W. H. Pearson of Norfolk and Dr. G. R. Harrison of Richmond as alternates.

The matter of determining the time and place of the next annual meeting was then considered.

Dr. BENJAMIN BLOXTON of Richmond moved that the time of the next meeting be the third Tuesday in April. The motion was seconded and debated, with the result that it was decided to hold the next annual meeting on the second Wednesday in May at Roanoke.

The report of the Legislative Committee was called for and was presented verbally by Dr. Campbell.

The society then adjourned until Thursday afternoon.

THURSDAY—*Afternoon Session.*

The meeting was called to order by the president at 1.30 P.M.

The first order of business was the election of new members, which resulted in the election of the following: E. B. Stiff, Cape Charles; E. P. Jones, Danville; W. G. Green, Toledo; W. L. L. Smoot, Miller's Tavern; H. W. Talley, Petersburg; E. B. Denton, J. M. Adams, and W. D. Myers, Winchester, R. W. Palmer, W. M. Sexton, and R. F. J. Hamilton.

The matter of the selection of nominations to be recommended to the Governor for appointment to the State Examining Board, which had been made a special order of business for 2 o'clock, was then taken up, with the following result: Drs. C. E. Harper, Danville; H. L. Smith, Charlottesville; J. M. Lewis, Richmond, and A. H. Sprinkel, Staunton.

Dr. MANNING stated that he had received a letter from Dr. Williams, president of the Virginia Health Association, sending greetings to the Virginia State Dental Association and commending the work of Dr. Harrison as a member of the State Board of Health. The secretary, at the request of Dr. Manning, read the letter to the association.

Dr. BEAR made a motion that the society authorize the secretary to have printed the new Constitution and By-laws, together with the Code of Ethics, and send a copy to each member of the society. The motion was seconded and carried.

Dr. MANNING expressed his thorough appreciation of the hearty co-operation of the members of the association with him in preparing for the meeting, and the uniform courtesy and support that had been extended to him during the session.

The society then adjourned until the next annual meeting.

Eastern Association of Graduates of the Angle School of Orthodontia.

Eighth Annual Meeting, held in New York City, May 7 and 8, 1917.

THE eighth annual meeting of the Eastern Association of Graduates of the Angle School of Orthodontia was held on May 7 and 8, 1917, at the Vanderbilt Hotel, New York City.

The meeting was called to order by the president, Dr. H. C. Ferris, New York City, on Monday morning, May 7, at 10 o'clock.

The vice-president, Dr. L. V. Singleton, Pittsburgh, Pa., took the chair, while the President read his address, as follows:

President's Address.

By H. C. FERRIS, D.D.S., New York, N. Y.

Having completed the eighth year of our organization, we have ample reason for congratulation upon our success. When we review the essays which have been presented during this period, we may feel, and justly, that we have advanced our science and broadened our scope of understanding by information bearing on our subject gleaned from other fields of study of the "healing art."

Prof. Louis E. Bisch, in his paper "Diagnostic Methods in Determining Feeble-mindedness," showed how to determine the mental status of our patients, and propounded another important problem, that of increasing the mental age of retarded subjects by producing normal occlusion and better functioning of the organ of mastication.

All proper orthodontic operations stimulate the nourishment of the patient by producing normal function of the masticatory organ, and invariably improve the general metabolic condition. Whether improvement in the cellular elements of the body will bring about medullary development which has been arrested in the brain tissues can only be proved by recording the mental status of the patient before and after treatment. Professor Bisch, after some personal observations, was quite hopeful that this could be effected, the measure of the success of the effort being determined by the Binet test.

Our clinical experience leaves no doubt in our minds that our operations improve the scholastic ability of our patients, and it is to be hoped that we may scientifically prove this premise.

Dr. A. LeRoy Johnson and H. K. Hatfield presented a paper upon the relation between the muscle power of the jaws and the hand-grip, in which they demonstrated that the normal power in the function of mastication parallels the power of the muscles of the hand in normal occlusion, and that the reverse is true in unilateral and bilateral malocclusion. This investigation adds one more proof to the evidence that the organ of mastication exerts a definite control over the voluntary nervous system that operates the muscles of the hand by receiving its nerve impulse through the third division of the trifacial nerve, which has both voluntary and involuntary action.

Dr. J. H. McCurdy of the Y. M. C. A. training school of Springfield, Mass., presented an essay on "The Development of Structure Through Exercise." He showed how the muscle function of all the parts of the human body, stimulated by physical exercise, improves the nerve tone, that control of the involuntary muscles directly influences the heart and circulation, and he maintains that the simplest method of determining this nerve tone is by taking the pulse-rate in horizontal and perpendicular positions. If the difference in these pulse-rates exceeds 20 beats, physical exercise of the jaw and body muscles is indicated.

Dr. Edward C. Kirk, dean of the Dental Department of the University of Pennsylvania, in his lecture entitled "Malocclusion as a Pathological Problem," reviewed the work of numerous writers upon the influence of the thyroid gland on the control of development of the body in general, giving reports of cases which had been benefited by treatment with thyroid extract.

At our annual meeting a year ago, Dr. John Kepke, in his essay, "The Relation of Mastication to Nasal Breathing," related through his clinical experience the manner in which function of the jaws and power of mastication influenced the blood supply to the postnasal space in the upper thorax, thus improving the functional activity of the thyroid and parathyroid glands.

The information we have received through these gentlemen of special training has improved our knowledge, and should serve as a stimulus to our specialty. To record carefully the physical, mental, and biological conditions of our patients before, during, and after our operations requires considerable time and expense in the handling of our practices, but no doubt will help to elevate our specialty from the field of mechanics to that of physiological science.

The operative procedure in orthodontia has received a great deal of stimulation in the last year through the introduction of mechanical apparatus by Dr. Edward H. Angle and Frederick Lester Stanton, for the accomplishment of tooth movement—the principal object of these improvements being to simplify and definitely establish our methods of procedure upon sound mechanical principles, so that the operation may be shortened, and the necessity of frequent visits, as in our older methods, lessened.

The new appliances have not been tested for a sufficient period of time for us to pass an intelligent criticism upon their value, but they present many features of improvement in attachment and application of mechanical force worthy of our consideration and study.

That we may not be carried away with the idea that we can practice orthodontia with mechanics alone, it behooves us to consider more carefully the normal forces, with their resting periods, that govern the growth and development of the teeth and bones of the face, and utilize these forces to assist in our operations, for though it may be pleasing to view occlusion accomplished with mechanical apparatus at the completion of two years' work, it is more gratifying to find the same occlusion stable at the end of five years. If it were required that such a period of time should elapse before we presented our reports for review at our societies, there would be fewer that we would consider worthy of presenting, for natural forces are sure to exert their influences on our finished work, and mark our errors in treatment.

Mechanical power is necessary in most cases to bring the developmental forces within normal influences, but functional exercise will accomplish much in producing perfect development that does not need retention, though it seems to demand considerable courage on the part of the operator to remove his appliances and attempt to force development through function. I am confident it will be less difficult in the near future, as many cases are being so treated that will furnish evidence upon which to base our faith.

That we are accomplishing more perfect and lasting results from our efforts to assist nature in attaining normal development of the jaws and bones of the head, and forcing the entire body to develop in like proportion, is proved by evidence that all of us can corroborate; but our ambition should be to ever increase our ability, and to attain a greater percentage of perfect results.

Some criticism has arisen in the minds of members of our society as to the ethical propriety of directing orthodontic procedure in the hands of the general practitioner, if a method were adopted where this direction could be reasonably accomplished. It is a subject to be approached with no little delicacy, entirely impartially, yet with the object in view of putting ourselves on record for or against this practice.

We have to weigh in the balance both sides of this question, deciding whether as a body of specialists we are to maintain our position as such, giving the best of our effort in adequate service to a comparatively limited number of cases, or whether we are to recognize our inability to cope with the enormous demands for orthodontic treatment which our limited number is totally unable to supply, or whether, by directing the efforts of non-specialists we are to assume automatically the moral responsibility for a vast amount of mediocre and unscientific work.

We do not wish to appear narrow or to any way limit the value of orthodontic operations upon humanity, but we are all cognizant, through practical experience, that in the majority of cases it is impractical and inadvisible for the general practitioner to undertake our specialty; if it were possible for one man to do both successfully, we would surely profit by our special education, and practice general dentistry at the same time.

That good results may be attained in the hands of general practitioners we acknowledge, but it is reasonable to believe that with equal ability they cannot afford to devote enough time to bring about the results accomplished by the specialist. This fact was settled long ago in the minds and practices of the leading dentists of the country, otherwise there would have been no demand for orthodontia as a separate specialty.

In this time of national stress, our country calls us to do our "bit" along with other trained men. How can an orthodontist assist in time of war? Our calling has been mentioned by the National Dental Relief Corps as one of five specialties to help form dental units. Those of us who can by training or development act as assistant surgeons may add greatly to the efficiency of that department with our mechanical ability in setting fractured jaws, and constructing and adjusting appliances to the teeth for that purpose.

In the infancy of our specialty treatment of fractures was considered part of our calling, but the demand upon our time in accomplishing tooth movement has greatly eliminated this work from our practice.

Dr. Edward H. Angle has designed a special fracture band for this purpose, with which some of you may have had experience, but a more complete apparatus is necessary to meet the exigencies of war, and I would suggest that a special committee be appointed by my successor to devise an appliance with interchangeable parts which will more adequately meet the needs of war conditions; and further, that this committee report at our first meeting in the fall, to the end that the product of our effort may officially emanate from our society, and be presented to the profession and the government as a part of its surgical equipment.

The program of our present meeting calls for no comment from me, other than to introduce the eminent gentlemen, each a specialist in his sphere, including anthropology, experimental medicine, and engineering; and I have no doubt that you will derive great benefit in your future practice through the information to be presented.

DISCUSSION.

Dr. Geo. W. Grieve, Toronto, Canada. There are two matters in the President's Address concerning which I would like to say something. One is the suggestion in reference to hospital service which we might render as assistants to the general surgeon. I felt a long time ago that men in our specialty could be of greater assistance to the general surgeon in setting fractures of the jaw than men in the general practice of dentistry. With that thought in view I made application to go overseas in that capacity, and found the military procedure in Canada such that it seemed impossible to get the department to accept my services except in the regular way as a dental surgeon. That would necessitate remaining for a long period in camp in the capacity of a general dentist, with the duties of which I was entirely out of touch, having been out of general practice for ten years, but there was no way in which I could get overseas except through the regular channels. The demand for dental surgeons was being well filled by men in general practice who could give better service than I could in that capacity.

The appliances might be improved, as the president has said, and a committee could be formed from this society for that purpose. Your government here might look upon it very favorably, and men able to give their services in that particular department would possibly be accepted, and get overseas and into the service very quickly.

This committee, if appointed, might be able to get some information from Lieut.-col. Guy G. Hume, a member of this society, whose address is the Ontario Hospital, Orpington, Kent, England. He is the officer in charge of the dental department of the hospital.

The other matter that attracted my attention was the direction by a specialist of orthodontic procedure in the hands of a general practitioner. I have tried handling a few cases in that manner where the patients lived some distance from me, but they have proved failures. I do not see how the general practitioner can assist us. In my experience, where I have permitted the patient to remain away too long, allowing the general practitioner to take care of the case, he has failed to see any adverse changes that were taking place, and there was nothing gained by having his questionable assistance.

Dr. A. P. Rogers, Boston, Mass. It might be possible for our members to be of value to the surgical units in France if we could place in their hands illustrations of appliances which we have found useful in the correction of fractures of the jaws. These illustrations could be explained in detail, in both French and English, and placed in the hands of the dental surgeons at the base hospitals. It has occurred to me to make this suggestion because some years ago I had experience with an extremely severe fracture of the jaw treated by the application of the principles which we use in our practice, and most satisfactory results were obtained, which could not have been reached by the general surgeon if he had relied solely upon bandages.

Dr. H. E. Kelsey, Baltimore, Md. During the last three or four weeks a gentleman has been in Baltimore who is very well known to the dental profession, Dr. D. O. M. LeCron of London. We have had an opportunity of seeing models of cases which he has treated at the front. Dr. LeCron has been in the American Hospital in France for many months, and he is, as you know, one of the best technicians in this country or anywhere else. Any orthodontist seeing his work would hesitate, I think, to attempt to originate appliances for use in face and jaw work at the front without much experience. We do not know this work over here; we must learn it. As a class we probably could learn it better than the men in general practice, because we have had special training somewhat more along those lines, but I doubt if orthodontists could invent appliances which would be very useful without being themselves there to apply them and find their defects and alter them.

If orthodontists could get from Dr. LeCron the result of his experience they might from this and the actual observation of appliances which have been constructed produce something of advantage, and those orthodontists who are or will be at the front may be able, through experience to improve appliances and present methods of treatment. It takes some of the conceit out of us, however, to see the really wonderful appliances and the results obtained as shown by photographs of models with the appliances which were used on them.

No doubt many of us would like to be at the front to take part in this interesting work, but those of us who cannot, can show our approval of the president's suggestion that we get such special training as we have into useful contact with the work to be done, so that we can be benefited and the work there can be benefited by our special training.

Dr. J. Lowe Young, New York City. It has occurred to me that the greatest assistance the orthodontist could render in the base hospitals at the front would be found in co-operation with the general surgeons. It is a well-known fact to all of us that the surgeon as a rule does not understand the occlusion of the teeth, and there is not the slightest doubt to any of us that we could be of wonderful help in reducing these horrible fracture conditions.

It occurs to me that any orthodontist who is acquainted with a surgeon of prominence who is going to the front might do well to get in touch with him before he leaves, and tell him we are going to try to work out something along this line. There is no doubt from the cases shown that wonderful work has been done over there, but as our president has said in his address, there is also no doubt that many of the cases that have been treated are not being shown because they have not been so successful. For example, I had a man in my office in January, in consultation, who had been shot through the head while doing duty at the front. All that had been done for that man was to simply wire his jaws together. When he was shot, the bullet went through the left side, fractured the ramus, and came out on the right side, fracturing the ramus on that side. His jaws were wired together, and at the end of two months they were ankylosed, and he had to be anesthetized and his jaws prized apart to get his mouth open. The man had a pretty good complement of teeth, and they were easily wired in place.

I think we should be able, as our president has said, to be of help in these cases. I have not had much experience in fracture cases, and I believe it really comes more under the head of the work of the oral surgeon. Most of those cases are hospital cases, and come into the hands of the oral surgeon; but conditions during the war are so different that any little help we can suggest is well worth while.

Another point in the President's Address was the question of the advisability of the orthodontist undertaking to treat cases in co-operation with the general practitioner. It seems to me that the practice of orthodontia and general dentistry cannot be carried on together. The reason for that is the fact that orthodontia presents so many problems that must be carefully thought out before treatment is instituted, and the general practitioner is not in position to give sufficient time to the study of the cases. To begin with, there are very few general practitioners who will take the trouble to get an accurate set of plaster casts of the dental arches, and if they do, they do not take the time to sit down and carefully outline a plan of treatment.

My experience has been, if the patient is called away for a considerable period of time, unless he can receive attention at the hands of an orthodontist, I would rather give instructions to the mother and have her look after the appliances, because the general practitioner is almost sure to "spill the beans" somewhere in the game.

Dr. J. A. C. Hoggan, Richmond, Va. There is no doubt in my mind that the orthodontist must find it possible to be of service at the front when it comes to the remedial treatment of fracture cases. To me that is not the greatest problem. The one with which I am concerned is, How is an orthodontist to leave his practice and go to the front? Can he conscientiously do so?

In every community wherever any effort is being made through the Preparedness League to form units, or to build up the Dental Reserve Corps, the orthodontist is asked, "What will you do?" The very plan of study that the Preparedness League has outlined lays great responsibility on the orthodontist. Can we conscientiously leave our practice? Must we not do something which will be of assistance in the way the president has suggested?

I should like personally the statement of opinion of this body, that the profession may understand that it is a consciousness of our own responsibility in this connection which leads us to do this, and not an unwillingness to do our bit.

Dr. Young. I have thought a good deal about the question brought out by Dr. Hoggan as to the orthodontist being able, and whether he has really the moral right to leave his patients and go to the front, but it seems to me we can probably work out some means that will be of wonderful benefit to the dental surgeon in his work with the general surgeon in the treatment of gunshot wounds and fractures.

Some months ago I saw a set of appliances adjusted on plaster casts by a prominent oral surgeon in this city who treats a good many fracture cases. He was using nickel-silver 16-gage expansion arches on the upper and lower jaws in a bad fracture case. He applied the clamp bands to the molars and put on the upper and lower expansion arches, and by placing wires around the teeth and the arch, and then wiring the two arches together, he said he produced wonderful results. In cases that had been treated by the general practitioner of medicine, and had gotten into very bad condition—the parts not in proper relation—by means of that method he was able to carry the anterior portion of the maxilla or mandible forward, and get a result that could not be obtained, perhaps, except by refracturing and resetting the jaws.

It occurs to me that this is a very good application of orthodontic appliances to surgical work.

Dr. L. V. Singleton, Pittsburgh, Pa. No doubt the incoming president will appoint a committee as suggested by our president; but for a general consideration of the whole subject at this time I would suggest the appointment of a committee consisting of Drs. Kelsey and Hoggan, to report at a later session of this meeting on this matter.

Dr. Ferris then resumed the chair.

The next item on the program was a paper by Mr. Gilbert Dudley Fish, New York City, entitled "Some Engineering Principles of Possible Interest to Orthodontists."

[This paper is printed in full at page 881 of the present issue of the Cosmos.]

DISCUSSION.

Dr. Geo. W. Grieve, Toronto, Canada. Referring to diagram 9, I think Oppenheim says there is no retrograde movement at the apex.

Mr. Fish. I will say that unless there are other forces in addition to the force I mention, the effect will necessarily be that. If there are adjacent teeth being moved out bodily, there may be biological forces to enable the tooth in question to move outward at the apex, but it is a mechanical problem. The resistance, depending on the pressure, will, I believe, cause the tip end of this tooth to move somewhat in the reverse direction; but it will depend on the amount of translation which occurs due to the applied force, combined with the amount of tipping due to the couple. It is possible, however, that the amount of the couple may be so slight and the resistance to tipping so great that the bodily movement of the whole tooth might more than compensate.

There may be a decided tendency for the apex to retrograde without any restraining tendency. If you can disprove that by clinical experience, well and good. It will then be necessary to search for further evidence to find out what forces are acting, for the forces must be obscure. Note that I have barred the application of any other force there.

Dr. Grieve. Do you contend that if that tooth represented a post in the ground and the force was applied in the direction of F 1, there would be a retrograde movement at the end of the pole?

Mr. Fish. Yes. Unless there are some conditions about which I know nothing, it must affect a tooth in the same way. There may be clinical evidence to disprove it, in which event there must be obscure forces acting of which we know nothing.

Dr. A. P. Rogers, Boston, Mass. I think one of the valuable points to be learned from the address just listened to is the desirability of orthodontists obtaining some education in mechanics. Although we have been interested in mechanics I feel that our thoughts have probably run more along artistic lines, and although we have some slight mechanical knowledge it is not based upon any scientific study of mechanics. Perhaps Mr. Fish will be glad to point out to us the best and quickest way to obtain this knowledge. There are no doubt a number of our men who would give serious study to those principles which could be applied to orthodontia. I am sure that we all would be glad to have Mr. Fish direct us either to the proper textbooks, or to some course which would enable us to obtain this needed education.

Dr. Milo Hellman, New York City. I want to compliment Mr. Fish for the able manner in which he has presented this interesting problem. The ideas expressed in his essay are of considerable gratification to me, because they convey in a large measure the convictions I entertain relative to the mechanics as applied in the treatment of malocclusion. For instance, I have always believed that the expansion arch is a very complex mechanism, even when employed in its simplest form, and when rigid attachments are added thereto its forces are complicated almost beyond analysis. It is therefore of utmost importance to be very cautious in the modification of the plain expansion arch by the addition of any rigid attachments.

It has also been of great satisfaction to me to be able to deduce from the essayist's remarks that though mechanics and mathematics are exact sciences they are unable to interpret biological phenomena. For instance, the statement made by Mr. Fish that in the movement of a tooth in a given direction, as illustrated by him, there is a retrograde movement at the root apex. This is true, as far as physical conditions alone are concerned, and I could verify these facts by experimental evidence. However, the experimental evidence of Dr. Albin Oppenheim (see *American Orthodontist*, vol. i, Nos. 2 and 3) clearly shows that this is not the actual occurrence in treatment. The histological changes taking place in the bone tissue surrounding the teeth illustrate beyond a doubt that there is hardly any movement at the root apex on the application of such force as was shown by Mr. Fish. Thus the experiments carried out by Dr. Oppenheim show that bone reacts to the exertion of force upon the teeth in such a fashion that there is hardly any change occurring at the apex of the tooth, while extensive changes take place at the gingival margin; and between these points—from the gingiva to the apex—there is a gradual decrease in the intensity of bone changes.

We are therefore forced to the conclusion that while mathematics is an exact science and can reveal the laws of physical phenomena, biological phenomena on the other hand, though also subject to definite laws, cannot be interpreted by mathematical calculations.

Dr. H. E. Kelsey, Baltimore, Md. Although capable of discussing but one or two phases of the paper, yet I would like to express a few thoughts. In the first place we have had our own conception of mechanics—I think nearly everybody has. The kind we mean when we speak of it as relating to orthodontia or to dentistry, it seems to me, has been the kind that we have connected in our own minds with the use of a hammer or a crowbar, that is, the idea of a man using tools of some kind, and we have not thought of it in a scientific sense. We have not tried sufficiently to apply it in that way to our work—the really sensible way to apply it. It seems to me that, notwithstanding the fact that there are biological factors in the movement of teeth which are not covered by mechanics, nevertheless mechanical forces applied scientifically and correctly, as can be done in the hands of one who understands them will certainly not act conversely to the biological laws, and it seems to me they would be much more in harmony with those laws if applied scientifically rather than experimentally, as we have done so often. So, while there might be factors not taken into account in a purely mechanical application of forces to the teeth and bones of the face, they would not be in opposition to those mechanical forces, and would certainly yield better to the scientifically correct forces than to the incorrect or defective mechanics which we very often use.

One case will prove easier than another, and when a case does not yield to treatment as readily as a similar one previously treated, we have too often thought the slow result was attributable to a difference in general physiological conditions. This is undoubtedly true to a great extent. Bone development does respond more readily in some cases than in others, but while this is true it may also be due to wrong application of mechanical principles based on our supposition that both cases were the same from a mechanical standpoint, in which event they could not respond to exactly the same mechanical application of force.

I want to thank Mr. Fish for his very clear presentation of an abstruse subject of which we had but little knowledge, and keeping to the A B C's of it. We would have been lost if he had not done so; probably we are a little lost anyway.

Mr. Fish (closing the discussion). The discussion of Dr. Rogers where he refers to the possibility of giving instruction in analytical physics is interesting. It is very much the same thought that several people, including myself, have had from time to time, and have even preached somewhat—namely, that mechanics not only could be, but *should* be taught to students in an abridged form; and that practitioners of orthodontia should study mechanics from some well-recognized text-books, or through some correspondence course of papers which either could be prepared specially or could be obtained at the present time by writing to almost any of the well-known correspondence schools. They not only provide you with succinct and good literature on the subject, but endeavor to answer your questions.

It is hardly to be expected that experienced and busy men in the practice of orthodontia could attend any prescribed courses. I do not know how many hours it would take to give a fair presentation, but a course lasting perhaps four weeks, on the basis of say one hour three times a week, or two hours twice a week, would give a very fair idea, and some opportunity for the solution of problems which are essential.

I was interested to hear Dr. Hellman's reference to the retrogression of teeth, moving in the way I have described. Whether such evidence is to be conclusive it is not my province to decide or even discuss, but the principle that there is a tendency for retrograde movement at the apex remains, and I am glad Dr. Hellman has to some extent at least corroborated me.

Dr. Hellman has spoken of the biological uncertainties as perhaps not necessarily nullifying or diminishing the evidence in regard to tooth movement. While the biological factor has introduced values which we cannot estimate with reasonable accuracy, yet, as Dr. Kelsey has later pointed out, there can be no actual conflict of true biological principles with true mechanical principles. If they do conflict, one or the other is wrong. As Dr. Kelsey said, they do not really conflict; it is only our inability to analyze the forces which do exist, which sometimes will point to a conflict or contradiction between biology and mechanics.

It is certainly better to use correct mechanics, as has been said, than false mechanics, because correct mechanics must be more nearly in conformity with what you have observed than faulty mechanics could possibly be.

Dr. Kelsey said that sometimes cases which appear to be similar have presented difficulties when treated in a similar way. His explanation was that it was possibly due to a misapprehension in considering the two cases to be really alike, and I believe there is no doubt that it is partly the individuality of the patient and partly the faulty mechanics which have been responsible for the result in the treatment of a case which looked exactly like another case.

I have avoided mentioning in this paper the predetermining of the arch form. There is far more likely to be a gross error in ascertaining the direction of tooth movements required. That is more apt to be responsible for a failure than a faulty application of force in cases which look to be alike.

(To be continued.)

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

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PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

Subscription Price, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Virgin Islands, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the Editor, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the Business Manager of the Dental Cosmos, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, SEPTEMBER 1917.

EDITORIAL DEPARTMENT

Oral Hygiene and the National Defense.

Seven years ago—to wit, October 1, 1910—Dr. William Hunter of London, in an address delivered at the opening session of the Faculty of Medicine of McGill University of Montreal, brought to the attention of the medical and dental professions a previously neglected though not unrecognized source of disease causation in badly constructed crown and bridge restorations. The contentions of the author, supported as they were by ample clinical observation, were startling, and so convincing was the evidence adduced that the address constituted an arraignment of septic dental operations that was unanswerable. The address was epoch-making.

In the period which has elapsed since the pronouncement of Dr. Hunter a tremendous advance has been made in the solving of the problem upon which his address focused attention. Bacteriological research has sought out the origins and nature of the pathogenic processes associated with the teeth and their retentive tissues; the technique of pulp extirpation and root-canal treatment has undergone fundamental revision; the principles of crown and bridge construction have been reorganized with respect to the canons of asepsis; a tremendous impulse has been given to the propaganda of oral hygiene in all its aspects, and above all, both the medical profession and the general public have come to recognize as a matter of common knowledge that oral infection, local or general, in any of its aspects constitutes a distinct menace to the health of the individual.

We have characterized the exhibit of Hunter as epoch-making. W. D. Miller, years previously, in his series of papers on "The Human Mouth as a Focus of Infection" had scientifically demonstrated the soundness of the principles upon which the clinical observations of Hunter are based. The findings of Miller had to await the clinical evidence furnished by Hunter before the truth of the situation could be recognized by exponents of the healing art and by the world at large. A new era was created—an era in which the old conception of dental pathology as a source of damage to the masticating mechanism has given precedence to a recognition of dental pathology as the most fertile source of direct damage to bodily health. Every writer since Hunter who has dealt with any aspect of the subject—and "their name is legion"—has helped to confirm the general principles involved in the problem of mouth infection as the direct source of bodily disease; but ignorance and prejudice, like ancient ideals, die hard. The old conception—that the consideration of primary importance with respect to the teeth is that they shall be sufficient in number and soundness for the purpose of mastication—is a conception that still holds sway in the average mind to a degree that is not only unwarranted, but dangerous in these strenuous times. We are in process of mobilizing an army of not less than a million fighting units, with a fair prospect of indefinite expansion of our defensive forces. The physical soundness of each member of this great group is the elementary coefficient of his fighting efficiency. We are now, in a very practical if not vital sense, face to face with the fact that a large percentage of the fighting manhood of our nation is not promptly available for national defense because of defective oral conditions that are in the main easily remediable.

The dental profession, recognizing the importance of the situation and with a fine spirit of patriotism, has undertaken, through the Preparedness League of American Dentists, to remove, so far as it lies in their power to do so, the dental disabilities of candidates for enlistment in the defensive service of the nation. Their efforts are handicapped, however, by a government regulation which in effect limits the services of civilian dentists to non-enlisted men; hence the work of putting the mouths of would-be recruits in hygienic condition before enlistment lacks effective organization because of the absence of an effective compulsory element. On the other hand, the government has provided for a corps of army and navy dental surgeons in the ratio of one dental surgeon to every one thousand enlisted men. Carefully computed statistical data tend to show that the average available working time of a dentist is about two thousand hours per year, upon the basis of which it appears that the government has made provision for an average of one hour of dental service every six months for each enlisted man—an amount of time wholly inadequate for the work required to be done. Any dentist who is giving full and efficient service to five hundred patients per year is in full practice. No dentist can give proper service in accordance with modern standards of practice to one thousand patients per year. To attempt to serve that number under army conditions tends to lower the standard of the service itself and is demoralizing to those who are engaged therein. The solution of the whole problem lies—

First—In a reorganization of the present methods of dental inspection of candidates for enlistment, by relieving the medical examining staff of this duty and assigning it to a corps of dental specialists, who alone are adequately trained to intelligently perform it.

Second—As a war measure and by special enactment, provision should be made to put the mouth and teeth of every recruit in proper hygienic order while undergoing training in cantonments and training camps. This work should be done by a sufficient body of dental hygienists and civilian dental operators specially employed by the government for that purpose only, and should not devolve upon the regular dental surgeons corps, for the reason that the dental surgeons corps will under existing conditions have thrust upon it more than double the work that it can actually do in keeping the mouths of enlisted men in order even after they shall have been put into hygienic condition.

Expert estimate indicates that it is entirely feasible to deliver to the government service one million men free from dental disability at a cost of approximately one-half million dollars for the dental professional service involved, and for not over one hundred thousand dollars additional for materials used. Considering the health insurance involved in such an expenditure, the increased efficiency that it involves, and finally considering that the man who pawns his life for the salvation of his country is clearly entitled to the best treatment his government can give him, such an expenditure would represent not only sound business economics, but a heartening expression of the national regard for the welfare of the guardians of its life and liberties.

And, finally, that the health and lives of our soldiers and sailors may be continuously safeguarded against the perils of oral infection, the present ratio of $\frac{1}{10}$ of one per cent. of dental surgeons to enlisted men should at least be doubled in order to maintain the standards of oral and dental integrity proposed to be attained by the second item of these suggestions for eliminating dental and oral sources of disease in the army and navy.

Reports from many recruiting stations indicate the seriousness of the problem which the factor of dental disability injects into the work of securing the required quota of men dentally and orally sound. It is not a time for dalliance with the situation. The only course is to face the conditions and meet them as they can and should be met, intelligently and efficiently. The problem here outlined is one which should be carefully considered by every American dental practitioner, and he should use his efforts and individual influence to assist the government in its prompt practical solution.

BIBLIOGRAPHICAL

FOCAL INFECTION. (THE LANE MEDICAL LECTURES.) By FRANK BILLINGS, Sc.D., M.D. Delivered September 20 to 24, 1915, at Stanford University Medical School, San Francisco, Cal. New York and London: D. Appleton & Co., 1917.

These lectures comprise a rather comprehensive epitome of the notable work done by Dr. Billings and Dr. Rosenow in the Presbyterian Hospital in Chicago during the past twelve years in their studies of the etiologic relation of focal infection to systemic diseases.

We feel safe in saying that no subject has commanded such absorbing attention, both from the medical and the dental profession, in recent years, as that of focal infections, and while this little book deals with the subject from the medical standpoint, much of the contained matter will prove of great interest to the dental profession.

Particular attention is given to pyorrhea alveolaris (called pyorrhea dentalis by the author) and alveolar abscess, as among the most prevalent sources of systemic infection, but by no means the only sources, as some dental practitioners seem inclined to believe.

A very valuable feature of the book is an extensive bibliography, by means of which those interested in the subject may be able to familiarize themselves with the work done on this subject by those most prominently engaged in studies of the various phases of focal infection.

MODERN DENTAL MATERIA MEDICA, PHARMACOLOGY, AND THERAPEUTICS. By J. P. BUCKLEY, Ph.G., D.D.S., Professor of Materia Medica, Pharmacology, and Therapeutics, Chicago College of Dental Surgery. Fourth Edition, revised; 146 illustrations. Price $3.50 net. Philadelphia: P. Blakiston's Son & Co.

The fourth edition of this very popular book has been thoroughly revised, and added to the former edition are articles on Dental Sterilization and Biologic Products. The chapter on Dental Sterilization has been added because of the general recognition by the dental profession of the necessity to treat teeth under as nearly aseptic conditions as possible, and the author gives us a method devised by himself after long and careful study of the subject that, if assiduously adhered to, will undoubtedly result in more generally satisfactory dental operations from the sterilization standpoint.

The chapter on Biologic Products deals with the use of products from the biologic laboratories, and is timely from the fact that dental practitioners are being more frequently than heretofore called upon to make use of such products in the treatment of dental conditions related to systemic diseases, and in this chapter is given a very clear exposition of the principles upon which this therapy is based.

The chapter on Dental Therapeutics has been considerably enlarged, and dwells particularly on a subject that is most prominently before the profession at this time, viz, the treatment of pulpless teeth and their sequelæ.

After outlining the methods advocated by Rhein and Callahan for the treatment and preparation of root-canals for filling, the author gives in detail the method he employs—namely, that of the use of phenolsulfonic acid—for the purpose, giving its advantages over the others, and follows this with the report of an interesting series of cases treated by his method and illustrated by radiographs of the cases before, during, and after treatment.

The chapters on Chronic Alveolar Abscess, Filling Root-canals, Pyorrhea Alveolaris, and Treatment of Diseases of the Soft Tissues of the Mouth, are profusely illustrated with color plates as well as with half-tones in black and white, which add materially to the value of the book.

An unusually complete index adds greatly to the value of the book as a reference work.

The presswork and binding conform to the high standard of book-making established by this well-known publishing concern.

Books Received.

Books received are acknowledged in this column, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

"Dental Metallurgy: For the Use of Dental Students and Practitioners." By EWING PAUL BRADY, D.D.S., Professor of Chemistry, Physics, Metallurgy, Materia Medica, and Therapeutics, Washington University Dental School, St. Louis, Mo. Philadelphia and New York: Lea & Febiger, 1917.

"Handbook of Anatomy." By JAMES K. YOUNG, M.D., F.A.C.S., Professor of Orthopedic Surgery, Philadelphia Polyclinic. Fifth edition, with 435 pages and 154 engravings. Price $2.00 net. Philadelphia: F. A. Davis Co., 1917.

"Practical Materia Medica and Prescription Writing." By OSCAR W. BETHEA, M.D., Ph.G., F.C.S., Assistant Professor of Materia Medica and Instructor in Prescription Writing, Tulane University of Louisiana. Second edition, revised. Price $4.50 net. Philadelphia: F. A. Davis Company, 1917.

"Surgery of Deformities of the Face; Including Cleft Palate." By JOHN B. ROBERTS, A.M., M.D., Professor of Surgery, Philadelphia Polyclinic. With 273 pages and 273 illustrations. New York: Wm. Wood & Co.

"The Internal Secretions: Their Physiology and Application to Pathology." By E. GLEY, M.D., Professor of Physiology in the College of France. Translated from the French and Edited by MAURICE FISHBERG, M.D., Clinical Professor of Medicine, New York University and Bellevue Hospital Medical College. 241 pp. Price $2.00. New York: Paul B. Hoeber, 1917.

"Zone Therapy, or Relieving Pain at Home." By WM. H. FITZGERALD and EDWIN F. BOWERS, M.D. With 191 pages and 33 illustrations. Columbus, Ohio: I. W. Long, 1917.

REVIEW OF CURRENT DENTAL LITERATURE

[*Lancet*, London, June 23, 1917, p. 956.]

Discussion on the Etiology and Treatment of Iritis. By WM. LANG.

[*California State Journal of Medicine*, San Francisco, July 1917.]

The Modern Treatment of Iritis. By M. W. FREDERICK.

Lang, president of the Section of Ophthalmology of the Royal Society of Medicine, has ascertained that in 200 cases of iritis in his private practice the various causes occurred in the following percentages: Syphilis 6, gonorrhea 12, tuberculosis 11, general affections 8.5, other causes 25.5, pyorrhea 37.

In no less than 74 of the 200 patients the sole cause found was pyorrhea. When these cases were seen early and the offending roots or teeth were removed the clearing-up of the iritis was strikingly rapid. Of the remaining cases 22 had pyorrhea in association with other disease conditions. In the cases in which pyorrhea alone was found there were twice as many women as men. Of the total number 48 per cent. had their mouths affected, and it would be of great value if members of the dental profession could recommend a preventive of this appalling state of affairs, which seems to lay the foundation for numberless diseases, involving all parts of the anatomy, including the eye.

J. G. Turner, speaking from the dental standpoint, stated as the result of his studies that probably the causal agent was an infection by means of the blood or lymph stream, either toxic or more probably actually microbial, and seldom by direct continuity of tissue.

Leslie Paton related a case in which he was able to obtain proof that the eye condition was directly due to the foul condition of a tooth root. The case started as one of deep keratitis profunda, and iritis developed later.

Most of Frederick's paper is given over to the consideration of iritis of venereal, particularly gonorrheal, origin. The text to the last paragraph discusses pyorrhea alveolaris and apical abscess as the etiologic agent. The author does not here give data from his own experience, but mentions some pertinent references, among which is a case of W. F. Blake, in which a man had a tooth extracted and recovered from a persistent eye trouble.

In the discussion following this paper, V. H. Hulen speaks of an acute and extremely severe case of uveitis. By exclusion a bad tooth was suspected as the exciting cause. Treatment of the tooth—not its extraction—was followed by a fairly magical recovery of the eye, which seemed almost on the point of disintegration.

[*Tijdschrift voor Tandheelkunde*, Utrecht, May 15, 1917.]

A Consideration of Root-canal Filling, Especially with Regard to the Use of Thymol. By P. BUISMAN.

The root-canals, after the ordinary pulpitis, as also after abscessing and gangrenous pulpitis, may be rendered bacteriologically sterile. However, if the pulp affection has progressed to a gangrene, that is not possible. In this last case, a continuing disinfectant action devoid of irritating properties is indicated. Thymol, introduced when melted into the root-canal, meets the conditions of a theoretically good filling material. Zinc oxid or basic bismuth nitrate may be added to it to permit radiographic control. After a somewhat extensive discussion, based upon his own experience and the literature, Buisman summarizes his views as follows:

The advantages of thymol are—

(1) Continuing (feeble) disinfectant action.

(2) Hermetically sealing the openings of the dentinal tubuli.

(3) An easy and dependable technique in applying it to mandibular root-canals and nar-

row maxillary canals in association with a mesial cavity.

(4) It may be introduced without pressure.

(5) As a result of the above facts, the duration of treatment of gangrene can be reduced normally to three sittings.

Its disadvantages are—

(1) Possible irritation in root-canals with a wide apical foramen.

(2) The absence of control-phenomena during its introduction, and therefore

(3) An uncertain technique in filling maxillary roots, particularly where the canals are wide and the cavities distal.

Thymol is indicated—

(1) In the treatment of gangrene in general.

(2) For the filling of narrow, curved canals, wherein a gutta-percha point would guarantee no complete closure.

(3) When extirpation in wide canals is likely to have been incomplete.

The contra-indications are—

(1) Cavities not easily accessible, especially in the teeth of the maxilla.

(2) Wide canals in the maxillary teeth.

(3) Wide apical foramina.

(4) Moistness of the wall of the canal or of the pulp chamber.

In conclusion, Buisman believes that while thymol theoretically meets many demands, this confidence can only be justified by extensive clinical experience.

[*American Journal of Surgery,* April 1917.]

A Method of Incising Parotid Abscess Without Injury to the Facial Nerve Distribution. By Howard Lilienthal.

The description of the method is as follows: A vertical skin-deep incision is made in front of the auricle, and just as close to it as possible. The incision is extended to the hollow behind the angle of the jaw, and thence in a gentle curve forward as far as the projection of the anterior border of the masseter muscle. The flap of skin thus formed is reflected forward, revealing the greater part of the parotid gland with its overlying fat and fascia. Incisions, as many as appear necessary for drainage, may now be made through the parotid fascia into the gland itself, the lines radiating in a general way along the course of the pes anserinus. No incision, however, should cross the line of Stenson's duct for fear of salivary fistula. Deeper collections of pus may be evacuated through this same cutaneous incision by puncturing through the fascia behind the ramus of the mandible, and then enlarging the opening with the director and dressing forceps.

The openings may be packed or otherwise drained, the cutaneous flap not being replaced until healing is well advanced, when it may be held in position with adhesive strips. A glance at the figures which accompany Lilienthal's paper visualize the process satisfactorily. The cicatrix resulting from this method is far less obvious than smaller ones made by drainage through the cheek.

[*Journal of the National Dental Association,* June 1917.]

The Aseptic Transalveolar Root-Resection Operation. By Robert H. Ivy.

In spite of the awkwardness of the title, there remains the indubitable advantage of its being to the last degree self-explanatory. We are not left to question what the author might mean.

This simple operation, after a period of some undeserved neglect, is receiving an ever-increasing amount of attention. The details of Ivy's operative procedure are realistic and admirable, but, like all descriptions of a technique, cannot be abbreviated from the original. However, after all, to the motives of this paper is due its peculiar importance.

The author has emphasized the following points:

(1) The advantages of the operation over extraction in cases of systemic disease associated with chronic periapical infection.

(2) The necessity of root-canal filling prior to the operation, and having the remaining portion of the root properly filled.

(3) The possibility of performing the operation in an entirely aseptic manner.

Ivy's consideration of the first point includes the indications for this operation, *i.e.* where it is believed that the vitality of the cementum has been impaired or destroyed, where the root-canal cannot be completely filled to the apex, and where the systemic condition of the patient demands immediate and certain eradication of the infective focus.

Other things being equal, the largest percentage of successful results will be in connection with the five maxillary anterior teeth.

Upper first molars can also often be easily reached. Lower teeth are, as a rule, unfavorable subjects for resection, because of the thickness of the external bony plate and because of the almost inevitable contamination of the field of operation by the saliva.

The third part of Ivy's paper is introduced by a strong insistence upon the rules of asepsis. "Success can only be assured by observation of the same precautions in this regard as in an abdominal section. . . . In order to attain this end, the writer has adopted a technique which embraces features of methods employed by several men," *e.g.* Moorhead and Williger.

It is only possible to give here a few items from the technique. It is practically never necessary to pack the cavity with gauze or to insert any form of drainage, if the operation has been performed with observance of complete asepsis. Where cases persist in refusing to heal, the injection of bismuth paste frequently brings about rapid results.

The above applies to the treatment of a chronic infection. "In cases presenting acute inflammatory symptoms . . . . the same procedure is followed, except that after resection and curetment the cavity is filled with bismuth paste and the flap fastened down with one suture, leaving space on each side for drainage and escape of the paste. Here, again, the prolonged treatment by packing is avoided. The patient receives immediate relief from the acute symptoms and healing takes place rapidly. In all cases the daily application of 25 per cent. solution of argyrol to the line of incision is of benefit."

This operation is destined to be more generally adopted. In it is found the realization of two often apparently irreconcilable desiderata: The demand of the physician for the removal of oral foci of infection, and the insistence of the dentist upon the necessity of maintaining the functional integrity of the masticatory mechanism.

[*American Journal of Obstetrics*, December 1916.]

Appendicectomy for Trifacial Neuralgia and Other Nerve Pain About the Head and Face. By M. I. Rosenthal.

Rosenthal states that it has not been uncommon in his experience to note cure of migraine or "sick headache" after removal of a diseased appendix. One of the 7 cases he reports is of this type. The remaining 6 are instances of neuralgia of the trifacial or one of its branches, or of pains previously treated unsuccessfully as due to sinus disease. In all but 1 case there was present almost symptomless chronic appendicitis of the obliterating type; the other was a symptomless pus case. In this case a gradual reduction of the pain followed the operation, and the nerve condition present was deemed to have been a neuritis. In the other 6 cases the pain ceased promptly with the operation, and the pain is asserted to have arisen through nerve irritation from selective toxins evolved by the appendix.

[*Boston Medical and Surgical Journal*, July 19, 1917.]

Technique and Interpretation of Dental Roentgenograms. By Herbert McIntosh.

This paper, while claiming nothing original, is of value because it is replete with sound common sense.

A formidable difficulty for the dental radiologist is the varying character of the surface against which the film is laid. McIntosh has never found film-holders of any value whatever. Exposures lasting from three to five seconds furnish excellent results. Powerful generators and slow films produce the best results. It is of great importance so to place the film in the mouth as to get a position well beyond the apices of the roots.

In order to obtain fine detail in the dental film it is necessary to keep the vacuum in the tube low. A tube with the best regulating device on the market and a rather fine focus will aid in securing the best results. The tube-stand should furnish a small diaphragm and cylinder for dental roentgenography.

Plate pictures are of no value in dental radiography, except under unusual conditions. Films should be mounted upon cardboard or celluloid of suitable size for filing in cabinets.

An error to be avoided is interpreting every apical rarefaction as a pus accumulation. Even after the infection has ceased, a dark spot may show on the film for one or two years, or even longer.

Another error may arise from the fact that the tissues through which the rays pass are of varying degrees of thickness (and density), and produce occasional dark areas which suggest an infectious process.

It is frequently possible to differentiate between an abscess and a necrotic condition of long standing by the shape of the dark area. An acute abscess is sharply marked off from the surrounding tissue; a necrotic condition of long standing has ragged and irregular edges.

McIntosh's chief purpose has been to warn against possibilities of error in the interpretation of dental films. Dark areas are not always indicative of infection, nor do they in all cases point to the necessity of extraction or even treatment.

[*American Journal of Physiology*, Baltimore, July 1917.]

The Diastatic Action of Saliva in the Horse. By R. J. Seymour.

The great diversity of opinion, as evidenced through the literature, upon this topic induced Seymour to undertake this study.

Both extracts of the glands and freshly secreted mixed saliva were used, as well as the pure secretion of the parotid and of the submaxillary. Mixed fresh secretion was secured from different horses; the isolated secretions were taken from but one animal. Over 100 tests were made. Controls were kept by the use of human saliva under the same conditions. A 2 per cent. solution of boiled cornstarch was employed. The temperature was maintained at 40° C. Fehling's solution was used to demonstrate the amylolytic action.

The conclusions deducible from these tests are as follows:

(1) The saliva of the horse, both mixed saliva and the isolated secretions of the parotid and submaxillary glands, contains a diastase capable of converting starch into sugar. The diastase is extremely feeble, requiring at least five hours for the conversion of the boiled starch.

(2) The action of the diastase (ptyalin?) was not augmented by aeration, by acidifying or by exposing to the action of weak alkalis.

(3) The saliva of the horse is inactive on cellulose and on sucrose.

(4) The experiments showed no evidence of the secretion of a zymogen with a subsequent conversion into active ptyalin.

(5) Salivary secretion may occur in the horse without mastication by stimulation with chemical substances, with an apparent augmentation through the psychic effect of the sight of food. The greatest flow occurs when the horse is permitted to masticate food material.

(6) Potassium sulfocyanid is not found in the saliva of the horse.

[*Bulletin de l'Académie de Médecine*, Paris, May 15, 1917.]

Importance of Vitality in Deciduous Teeth for Physiologic Dentition. By Luciani.

In examining large numbers of deciduous teeth Luciani noticed that the normal absorption of the roots occurred completely only when the pulp of the tooth was in normal condition. The physiologic integrity of the tooth is indispensable, he declares, in preparation for the normal process of second dentition. All his evidence proclaims the importance of preserving the vitality of the pulp of the deciduous teeth until they are ready to drop out from the absorption of their roots.

[*Journal of the American Medical Association*, Chicago, June 9, 1917.]

Bilateral Pneumococcal Parotitis: Report of Case. By John V. Barrow.

Pneumococcal parotitis, either as a complication of pneumonia or as a focal pneumococcal involvement, is rare. Whether associated with pneumonia or occurring as a primary condition, it is always a serious expression of a grave condition.

The majority of cases occur in the aged and debilitated. The earlier the complication arises in the course of a pneumonia, the more serious is its import. The lung involvement is not aggravated by the appearance of the parotitis, but the symptoms from the pneumococcemia are markedly increased. In a few cases in which the complication has occurred late, lung resolution has seemingly been hastened.

Of the thirty cases gathered from the literature by Barrow, only eight were bilateral. Resolution of the glands has been slow. As a rule, the pathologic process goes on to suppuration. Drainage has been accomplished through the ducts naturally or through incision. Spontaneous resolution is reported in some cases. Barrow's own case is unique in its termination by crisis. It may well be classed with other reported focal pneumococcal infections in which crisis has terminated a pneumococcemia in which there has been no lung involvement.

[*Journal of Parasitology*, June 1917.]

Endamœba Buccalis: Its Multiplication and Periodicity. By Nadine Nowlin.

The twofold object of this report was (1) to find the cause of the periodic disappearance of these parasites from the human mouth, this phenomenon pointing to a solution of the life history which has not been solved; and (2) to determine by tonsillar smears and sections whether this endamœba is ever intracellular.

The specimens used in this study were collected entirely from one host and from one point of infection. Daily record was kept of the occurrence of these parasites for a period of over five months; moreover, a study of the parasite was made at various times of day and night.

During the five months there were nine periods when it was difficult to demonstrate the organism in the mouth. Nowlin suggests as an explanation of this disappearance a migration of the endamœbæ into the gingival and periodontal tissues.

The organisms were studied alive, in the hanging-drop. Neutral red of the *intra vitam* stains differentiates the food vacuoles very quickly. For nuclear studies three standard methods were employed.

The observations point to a complex type of mitosis. The chromatin condenses into four very distinct bodies during the prophase. The spindles of the succeeding phases are distinct, and appear to have a centrosome at the poles. Direct evidence of conjugation was never encountered. Reproduction by budding or simple binary fission was not observed. Multiple fission was found in only about six specimens out of the hundreds examined. A form of encystment is described.

Encystment in E. gingivalis is closely connected with the "scarce" periods. These periods were invariably synchronous with some slight indisposition on the part of the host.

Nowlin believes that E. gingivalis withdraws to the gums to encyst, and that this explains why encystment has been so rarely reported.

The attack upon the second object of this study (intracellular occurrence of the parasites in tonsillar tissue) has barely been begun. So far the results in this direction have been negative.

[*Lancet*, London, June 9, 1917.]

Double Dislocation of the Jaw Simulating Fracture of the Skull. By E. C. Hare and Sydney J. Cole.

This is a brief note of a single case. The man, age twenty-three, had fallen in an epileptic fit, striking heavily on his chin. The subsequent developments strongly resembled sequelæ of fracture of the base of the skull. Death ensued. Postmortem examination revealed the base, as viewed from within the cranium, to be intact, and no injury or recent disease of the cranial contents. There was a fracture of the tympanic plate of each temporal bone and septic arthritis of both temporo-mandibular joints. What had happened in the fall was that the condyles of the jaw had been driven backward, smashing the tympanic plate, encroaching upon the external auditory meatus and opening a way from the meatus into the joint, with the result that septic arthritis had been set up. There was no fracture of the mandible.

[*Bulletin of the Lying-in Hospital of the City of New York*, May 1917.]

Appendical Abscess with General Peritonitis by Streptococcus Viridans. By J. W. Markoe.

The source of infection in this case, in Markoe's opinion, was very evidently the roots of certain teeth. Reproductions of X-rays from the patient's mouth after recovery illustrate areas which easily could be interpreted as such foci.

The culture from the pus evacuated from the peritoneal cavity at the time of operation was a pure culture of streptococcus viridans. No mention is made of cultures from the roots which later were extracted. The chain of evidence by which the author would connect the dental infectious focus with the appendical abscess is absolutely lacking. The teeth may have been the root of the evil, but that has not been proved.

If Markoe's opinion be correct—there is no strong or direct evidence that it is—this case would be confirmatory of Rosenow's view that appendicitis, in the absence of foreign bodies, is commonly a hematogenous infection.

PERISCOPE

Slow Pressure for Setting Dowel Crowns.—You may not know at the time that you have fractured a root or tooth in setting a dowel crown or inlay by driving it to place with a mallet, but you will find it out later. Freshly mixed cement is a liquid, with the physical property of transmitting force equally in all directions. Any blow or sudden application of force is received by the frailest part of the supporting structure. Steady pressure applied by a plugger or file that cannot slip accomplishes the object more quickly and accurately, with less risk and discomfort to the patient.—J. FRANK NELSON, *Dental Review.*

An Easy and Simple Method of Repairing a Crown or Bridge with a Broken Pin Facing.—Take the measure from center to center of the pins left in the backing, and from the pins to the incisal edge of the backing, and select a new facing with pins to match the measurements, and of about the size of the broken facing in other details. Place the convex part of this facing in a small mount of plaster, and when well set cut the pins off flush with the porcelain. Add a little oil and with a small drill in the handpiece cut out the portions of pins left in the porcelain. An inverted-cone bur and some carborundum powder from the lathe will quickly clean out all metal and enlarge the holes slightly. Reduce the heads of the old pins left in the backing, and grind the facing carefully to adjust it to the form of the first facing, trying it frequently in the space to be repaired. When shaped roughen the porcelain and cement to place.—CHAS. S. HART, *Dental Review.*

Selection of Teeth for Root-Resection Operation.—In contemplating the advisability of doing this operation in preference to other procedures such as extraction, several factors must be considered, the most important of which is the position of the tooth in the mouth. Other things being equal, the largest percentage of successful results will be in connection with the five upper anterior teeth, as these are most accessible, and can be operated on with the least risk of contamination from external sources. Upper first molars can also often be easily reached if the mouth opening is a wide one. Lower teeth are as a rule unfavorable subjects for resection—(1) because of the thickness of the external bony plate, and (2) because of the almost inevitable contamination of the field of operation by the saliva. In upper incisors, canines, and premolars, root resection for apical disease is to be preferred to extraction where not more than the apical fourth of the root is involved, where the tooth has not been loosened by the disease, and where at the same time there is little or no destruction of peridental membrane or alveolar process at the cervical margin.—R. H. IVY, *Journ. National Dental Association.*

Diet in Relation to Dental Caries.—The following practical proofs may be verified in nearly every instance by personal observation and inquiry as to diet: That those children strongly susceptible to dental caries are eating a one-sided diet of a great excess of starchy food, especially white bread, combined with sweets, piecing between meals with more starchy food, with a limited amount of fresh vegetables and fruit at mealtime. An inclination toward malnutrition is to be observed in most of these children.

In the adult susceptible to caries again we find a preponderance of starchy food and sweets, often a great variety of starches at the same meal, to the exclusion again of fruits and vegetables so essential to combustion and elimination of waste, resulting in acid fermentation, acid absorption to saturate the bodily secretions, and an inclination to digestive disorders, often malnutrition.

In pyorrhea, where the teeth are so often found sound, a plain diet is usually the rule, with little sweets, though composed of meat, bread, potatoes, heavy foods, lacking in the element of fruit and vegetables. In such cases a coated tongue with its story is observed, a tendency to rheumatism in later life, a system saturated with uric acid wastes, to be deposited by nature in weakened parts.

Where the teeth are not decayed, we seldom find sweets of any quantity combined with starch, as this guilty pair go hand in hand, the sugar as the palate coaxer, the starch as the great destroyer.—C. B. BRONSON, *Dental Summary.*

Contra-indications to the Treatment of Pyorrhetic Teeth.—(1) If a tooth has no remaining normal attachment it should be removed.

(2) If the pocket or pockets extend to the apex of a tooth or teeth the pulp usually is involved—and the root is indented with absorption. This condition contra-indicates treatment, and extraction is advised. Operators often excise the root-end when this condition exists, but the writer's experience in this operation is not encouraging—the percentage of failures to bring about perfect health about an excised root is too great.

As to whether osteoclasis has burrowed the root, this can usually be determined by delicate but rigid probes, or by the X-ray.

(3) Antrum involvement. Not infrequently pyorrhea pockets extending to the apex of bicuspids and molars in the superior maxilla result in the death of the pulp, and subsequently abscess of the maxillary sinus is found.

This condition in pyorrhea demands the removal of the tooth, for there has been too-long-continued disease to hope for successful treatment.—J. D. PATTERSON, *Journ. National Dental Association.*

Reattachment of Peridental Tissues in the Treatment of Pyorrhea.—The most striking feature in the pathology of the chronic abscess and the pus pocket is the denudation of the cementum. As a result of a suppurative process, the peridental membrane is detached from the cementum, and the detachment being maintained for a time, certain tissue changes occur which should be clearly understood as a basis for determining rational treatment. The cementoblasts of the area are destroyed, the fibers of the peridental membrane, which are detached, gradually disappear from the overlying tissue; likewise the corresponding area of bone of the alveolar process is destroyed or absorbed. The detached tissue, irritated by the contents of the pocket, and possibly by deposits of calculus on the cementum, becomes an inflammatory tissue, and is invaded by micro-organisms from the pocket. The cementum becomes saturated with the products of the suppurative process, the cement corpuscles die; the cementum is practically a necrosed tissue, but it cannot be exfoliated because there is no circulation of blood in cementum as there is in bone.

What, then, is the problem which confronts us when we undertake the treatment of such an area with the hope of securing a reattachment? The cementum itself is an entirely passive tissue; no activity may be expected of it. The cementoblasts, the only cells which can lay down new cementum, have been destroyed, as have been the fibers of the peridental membrane which would normally be embedded in the cementum. While it may not yet be fully proved that there can be no regeneration of these specialized elements, it seems no more likely than the regeneration of the terminals of either the optic or auditory nerve, or of the nail matrix, or the hair follicles, when these are destroyed.

The condition of the cementum is of greatest importance in this connection. To have an attachment of any kind, whether it be normal peridental membrane or a simple adhesion of the overlying connective tissue, the soft tissue cells must necessarily live in physiological contact with the cementum. There is no more prospect of reattachment to pus-soaked cementum than there is of the attachment of soft tissue to a sequestrum of necrosed bone. The cementum, by the absorption of the products of the suppurative process, has become a negatively chemotactic tissue, and attachment of any kind is out of the question.—A. D. BLACK, *Journ. Allied Societies.*

"Collosal Cocain."—What is known as "collosal cocain," in which the alkaloid exists in colloidal form isomorphic with the colloidal protein of the body, has been prepared at the Crooke laboratories, and already the results of some remarkable experimental trials strongly support the expectation of realizing what is practically a complete elimination of the toxic effects of cocain. As regards the relative toxicity, tests made by the intravenous injection of rabbits, carried out by Prof. W. G. Simpson, King's College, London, and Prof. R. Tanner Hewlett, University of London, it was found that whereas about 3 cc. of a 1 per cent. solution of ordinary cocain hydrochlorid (equivalent to about ½ grain) is a fatal dose for a rabbit, 2000–3000 grams' weight, injected intravenously, of the collosal cocain, 10 cc. of the 1 per cent. preparation (equivalent to 1.6 grains) produced no toxic effect whatever.

Equally striking results as to the absence of toxicity in the intravenous injection of collosal cocain in rabbits have been reported also by Dr. John Eyre, Guy's Hospital. From a small number of tests upon the human subject, Dr. Eyre is satisfied that the Crooke collosal cocain can be regarded as an efficient local anesthetic.—*Dental Record.*

Interpretation of Radiograms.—The ability to interpret a dental radiogram is an accomplishment worthy of our serious thought. There is no royal road to success in this particular line of work. To acquire proficiency requires as strict attention to detail as obtains in other departments of dental surgery. One must have a thorough knowledge of the topographical and internal anatomy of the head, a thorough understanding of the technique of producing the radiogram, and must be familiar with the radiographic appearance of the parts involved under normal conditions.

It is not safe to assume that a radiogram will show a pathological condition. It merely shows a deviation from the normal which may be of pathological or physiological origin. We should never hazard a diagnosis from radiographic findings alone, but should supplement them by other diagnostic means. We cannot determine from a radiogram the specific contents of a cavity or resorbed area. It is impossible to differentiate between the pulp, pus, cotton, or air in a root-canal, so unless the root-canal is filled with some substance opaque to the rays, we are unable to determine from X-ray evidence whether or not the tooth is vital. Likewise, a dark area at the apex of a tooth cannot be positively diagnosed as an abscess, even if it is markedly circumscribed. It may be one of several pathological conditions, the true nature of which we cannot determine from the radiogram. The X-ray is distinctly a diagnostic aid, and, when used as such, is capable of being of great assistance to us; but if allowed to be regarded as a positive means of diagnosis, it is liable to do much harm.—L. E. Carter, *Internat. Journ. of Orthodontia.*

Use of the Matrix in Amalgam Restorations.—The nature of amalgam is such that a good impervious filling thoroughly adapted to the walls of the cavity cannot be made unless there are four walls to the cavity. If one or more of the walls be missing the mass will move out of the cavity in the direction of least resistance during the attempt to condense the filling. In order to prevent this we have to supply the missing wall or walls, and this is done with the matrix. There are a number of manufactured matrices in the market, each one of which may have its particular merit, but the matrix that is made for the individual case is the better in the majority of cases. Sheet copper of 35 gage is advised, and may be obtained from the depots for this purpose. A suitable piece is cut and shaped and is then tied around the tooth with floss silk, the silk wrapped about the tooth, and tied with an ordinary knot, then wrapped around again as many times as necessary to obtain the required shape and rigidity. Small wings are turned up at the corners of the copper at the gingival margin in order to engage the silk and prevent its slipping off of the metal and under the gingivæ. When the matrix is in place a hole is cut at the contact point and a slit carried through the copper band to the occlusal surface, this to facilitate the tearing of the matrix after the filling is made, and rendering the removal of the matrix easy. The hole through the matrix at the point of contact enables the operator to pack his amalgam directly against the approximating tooth, and thus make the tightest possible contact point.

After the filling has hardened to a safe point the matrix is removed, and the filling carved to form.—J. V. Conzett, *Journal National Dental Association.*

Manipulation of Silicate.—*Making the mix.* Begin with sufficient liquid on the slab, and do not add any more at any stage. Mix by drawing into the liquid about one-half of the total amount of powder required to make the completed filling. Begin the mix by spatulating with a slight rotating movement; hold the spatula flat on the slab, describing the arc of a small circle with a diameter of, say, one-fourth of an inch. As soon as the powder has been all incorporated and the mass rendered uniform, scrape all of the mass off the slab with about three strokes. Take one-third of the mix each time. This assists in securing uniformity of the mass. Then put it back on the slab, this time getting all off the spatula. Do not scrape the spatula on the edge of the slab, but place it flat on the slab, holding it firmly, and giving it a turn in the hand, which will practically clean it. Here more powder is added, a small portion at a time, and incorporated in the mass already mixed, by the method of crowding, which is done by rolling the spatula first against one side of the mass on the slab and then against the other. The addition of the powder by this crowding process is continued until the mass becomes of the consistence of putty, losing practically all of its adhesiveness, and giving only slight evidence of a tendency to follow the spatula from the slab. The proper consistence is reached when the mass has been mixed so stiff that the material just loses its gloss when being crowded by a rotating spatula, yet can be made to show a glossy surface when patted three or four blows with the spatula. In case the material looks very wet and glossy the mix is not yet stiff enough. If the three or four blows do not produce gloss, the mix is too heavy, and must be entirely discarded.

Time of the mix. The lower the temperature at which the silicate is mixed the longer may be the time of manipulation; the thicker the mix, the longer will it be before the chemical action of the setting will be noticed. By using the cold process of mixing, the time for manipulation is lengthened, and the time of setting after leaving the slab is materially shortened, due to the thick mixture obtainable.—W. C. DAVIS, *Journal National Dental Association.*

A New Theory of "Rickets."—Dr. Eric Pritchard, physician to the Queen's Hospital for Children, has lately brought forward a new theory or explanation of the process by which the chief pathognomonic symptoms of rickets are produced. In an original paper contributed to the *Medical Press*, December 20, 1916, he states that all the symptoms usually associated with rickets, such as muscular debility, nervous excitability, sweating and malformation of growing bones, are but a natural attempt of the body to counteract the injuries produced on the tissues by an acidotic condition. The extent of acid formation in the body must be excessive or the protective mechanism inefficient or thoroughly exhausted before a state of acidosis of sufficient intensity can be set up to damage the cell elements. Hence the bony changes of rickets are rare in comparison with the symptoms of malnutrition which spring from the same cause. This acidosis may be attributed to many causes, but it can ultimately be traced to over-feeding. Overfeeding, Dr. Pritchard explains, is a relative term, and must be gaged by a comparison between the caloric value of the food ingested with the energy output of the child. Thus a diet which is just sufficient for a normal child vigorously exercising itself in healthy surroundings would be excessive for a weakly infant whose natural movements were cramped by improper clothing and nursing, and whose oxygen intake was restricted. This physiological excess of food may be dealt with by the body in several ways. It may be partly excreted and partly stored in the form of fat and glycogen. But there is a limit to the possible storage, and so the body turns to other methods of disposal. If the oxygen supply is sufficient the surplus may be fully oxidized to the normal end products—carbon dioxid, urea, and water, but if not, then halfway acid products are formed, such as lactic, uric, diacetic, oxalic, glycuronic, to name only a few of them. These in turn combine with alkaline bases present in the tissues, particularly calcium, ammonium, potash, soda, and iron, so that metabolism is upset and the body robbed of salts that ought to be otherwise employed in tissue formation.

Again, food which is not properly digested and prepared for assimilation in the alimentary canal decomposes and ferments, thus producing injurious substances, which when absorbed into the blood stream exercise a toxic effect on the nervous system and thereby impair muscular and other functions. Interposed between the portal system, which first receives the substances absorbed from the intestines and the systemic circulation, is the liver. This organ Dr. Pritchard describes as "the great crematorium of waste and poisonous matters," and if, through overwork or inherent disabilities, this organ no longer acts as an efficient buffer between these intestinal poisons and the tissues of the body, the conditions already described become manifest.

The bony changes so characteristic of advanced forms of the disorder are easily explained by this theory. The overgrowth of the cartilaginous foundation of bone is largely compensatory, and represents an effort to secure rigidity by excessive growth. The mineral matter which has been taken up by the adventitious acids is no longer available for deposit in the osseous tissues, and in the same way iron has been lost, and so anemia results, to combat which there is compensatory enlargement of the epiphyses with their blood-forming centers in the marrow. The irregular formation of rickety bones is also probably due to the disordered condition of the nervous system and to the want of the normal stimuli produced by healthy muscular action. Demonstration of the presence of acidosis by laboratory tests can hardly be expected, for an appreciable amount of free acid is not compatible with life, and the whole protective mechanism of the body is directed toward the neutralization of free acid as soon as it is formed. These neutral salts in turn are promptly excreted by the kidneys and skin, so that the body is drained of its natural elements.—EDITORIAL, *Medical Officer*, per *Dental Record.*

HINTS, QUERIES, AND COMMENTS

Some Hints Worth Recording.

I. Repair of Broken Facing.

To the Editor of the Dental Cosmos:

Sir,—I had recently a case of a broken facing to repair that puzzled me somewhat, but which I solved at last to my great satisfaction. The case was that of a broken facing of a central Darby crown, to which a lateral facing was attached. The central was short and broad, and as the root was considerably hollow and decayed deeply under the gum, I cast a base to the dowel, to which a facing was soldered. The solder inside of the facing was quite thick.

The central facing broke under pressure, leaving a part of the platinum pins on the facing. To remove the crown in order to attach another facing would have proved fatal, as the inlay was deeply embedded in the hollow root, which would probably have been fractured on any attempt to dislodge the tooth. I could not use Bryant's repair system, as the solder was quite thick, and I was unable to obtain a pin tooth with pins long enough to reach the lingual side for the insertion of the "nuts"; nor was it possible to use the Jackson or the Steele repair system, as the tooth was broad and short, and a removable facing would not hold properly.

Inserting in the center of the backing a Jackson "T" of the Jackson repair outfit, I molded around it synthetic cement of proper shade, polishing the cement to get a nice gloss. The restoration is very satisfactory.

II. To Stop Gas from Leaking Through Rubber Tubes.

I attached a Bunsen burner near my operating chair for use instead of an alcohol lamp. For some time I smelled gas, but could not detect any leak with burning matches. I then had a plumber inspect the gas pipes, and he pronounced them to be all right. As I could not stand the odor of the gas, I painted the rubber tubing leading to the Bunsen burner with sandarac varnish and allowed it to dry, when the odor disappeared altogether. Some rubber pipes have pores through which a slight amount of gas escapes, but become impermeable on the application of varnish.

The idea of painting the tubing with varnish came to me from the following incident: I had been using an S. S. W. gas and oxygen apparatus for about two years with the greatest satisfaction, when suddenly I failed to produce proper anesthesia. Suspecting a leak, I purchased a new inflatable rubber piece for the celluloid inhaler, also new rubber piping for connecting the cylinders with the apparatus, but saw no improvement. Many patients I failed to anesthetize fully, and in those cases where I succeeded, the anesthesia was only of very short duration, necessitating the use of an extraordinary amount of gas. I finally had an expert examine the apparatus, and he discovered that the long pipe leading from the apparatus to the inhaler made a cracking noise upon being bent. He advised me to get a new pipe, which I did, and which is giving satisfactory results. The pipe looked to be perfect from the outside, but the rubber tubing inside of the silk covering evidently disintegrated in the course of time, resulting in the formation of pores that caused the leakage.

Herman Ausubel, D.D.S.

Brooklyn, N. Y.

Detached-Post Crown: Removing a Broken Pin.

To the Editor of the Dental Cosmos:

Sir,—To remove a broken pin from a Davis or other detached-post crown, immerse the crown in diluted sulfuric acid for a few hours, when the pin can be easily removed and the crown used again, with pin of proper length.

C. E. Harper.

Danville, Va.

OBITUARY

Dr. George Alfred Wilson.

DIED, June 9, 1917, at Babylon, Long Island, N. Y., from gastric perforation, followed by peritonitis, in his seventy-fifth year, Dr. GEORGE ALFRED WILSON.

Dr. Wilson was born in Newcastle, Me., April 2, 1843, his parents being Alfred and Mary Wilson. He obtained his early education in the schools of Newcastle, and in 1866 began the study of dentistry under Dr. Wm. H. Atkinson, in New York City, in 1869 establishing himself in the practice of dentistry in the same city, where he continued until June 1916, when he retired from work.

Dr. Wilson took an active part in dental society work, serving the Odontological Society of New York as corresponding secretary, and later the Institute of Stomatology in the same capacity. In 1916 he was elected to honorary membership in the First District Dental Society of the State of New York.

Dr. Wilson was one of the pioneer gold workers of his time, his manipulative skill comparing favorably with that of the famous foil workers of the early days of dentistry. He prided himself upon his early association with that eccentric but remarkable man, his preceptor, Dr. Wm. H. Atkinson, and many of his professional brothers who knew him will recall a remark he frequently made, that he was "one of Atkinson's boys." Of Maine parentage, Dr. Wilson was one of the sturdy New England type, sincere and loyal to all that was good in dentistry; quiet in his manner, sincere in his friendship, with a nobleness of character that won for him the love and respect of all who knew him.

Dr. Wilson was married in 1869 to Miss Laura T. Merrill of Nobleboro, Me., and is survived by a son, Dr. George A. Wilson, Jr., of New York City, who succeeded him in practice, and two daughters.

Interment took place at his old home, Newcastle, Me.

Dr. Charles Emory Edwards.

DIED, June 7, 1917, at his home, Ocean City, N. J., from arterio-sclerosis, CHARLES EMORY EDWARDS, D.D.S., in the eighty-first year of his age.

Dr. Edwards, son of Rev. Noah Edwards, a pioneer Methodist Episcopal minister, was born October 10, 1836, at Tuckerton, N. J., where he obtained his early education.

Dr. Edwards was graduated from the Pennsylvania College of Dental Surgery in 1857, and immediately commenced the practice of his profession at Millville, N. J. During the civil war, however, he gave up dentistry, and conducted a photograph gallery at Bridgeton, N. J.

At the close of the civil war he again took up professional practice, and associated himself with Dr. I. S. Fogg in Philadelphia, which connection continued until 1873, in which year Dr. Edwards went to Chile, where he established himself in the practice of dentistry, and where he remained for a number of years. While in South America he was active in establishing the first Masonic lodge in that country.

On returning to the United States, Dr. Edwards began practice in Colorado Springs, Colo., where he remained for a number of years, later practicing in Haddonfield, N. J., and finally associating himself with Dr. J. C. Curry in Philadelphia.

Dr. Edwards was a clinical dentist of the old school in all which that implies in painstaking care and thoroughness; affable in manner, immaculate in his personal appearance; a Christian gentleman with the highest professional ideals, which he strove to realize.

Dr. Edwards was married in 1857 to Miss Augusta Willets of Port Elizabeth, N. J., who with one son, Dr. Reuben Edwards, survives him.

Interment was made in Harleigh Cemetery, Camden, N. J., Monday, June 11, 1917.

DENTAL COLLEGE COMMENCEMENTS

Philadelphia Dental College (Temple University).

THE annual commencement exercises of Temple University and Philadelphia Dental College were held on June 9, 1917, in the American Academy of Music, Philadelphia, Pa.

An address was delivered by Rabbi Stephen S. Wise, Ph.D.

The degree of Doctor of Dental Surgery was conferred by the president, Russell H. Conwell, D.D., LL.D., on the following graduates:

Abram R. Adams	Pennsylvania
Aurelio E. Arias	Panama
Henry P. Ash	Pennsylvania
Benjamin Benedict	Pennsylvania
Rush G. Benedict	Pennsylvania
David Baker	Connecticut
Annie Cahan	Pennsylvania
William J. Cassidy	New York
Dugald W. Clark	Connecticut
José R. Cóbar	Central America
Bion P. Cook	Maine
Samuel Cornfeld	Pennsylvania
Frederick J. Creasy	Pennsylvania
Franklin G. Daily	Pennsylvania
Perley R. Damon	Maine
Harold F. Doyle	Rhode Island
Earl A. Dunfee	New Jersey
Raúl Durón-Membreñore	Central America
W. Kiple Dutcher	Pennsylvania
Earl C. Elliott	Maine
Reuben Fisher	Pennsylvania
Benjamin Feldman	Pennsylvania
Samuel Friedman	Pennsylvania
Mackie C. Generette	Connecticut
William E. Gildea	Pennsylvania
David W. Griffith	Pennsylvania
Thomas H. Harding	Pennsylvania
Raymond L. Holt	Massachusetts
Joseph J. Humphries	Pennsylvania
J. P. Georg-Jensen	Denmark
Theodore R. Johnson	Connecticut
Truman W. Jones	Pennsylvania
Roy C. Joslyn	New Jersey
Charles F. Kauffeld	Pennsylvania
Earl R. Kay	Canada
Charles G. Knoll	New Jersey
William E. Larkin	Connecticut
William Laub	New Jersey
Thomas P. Lavin	Pennsylvania
Braulio Lizama, Jr.	Central America
Armando Lopez de Leon	Central America
Henry R. Lubeck	Australia
Francis J. Lynch	Massachusetts
Joseph Marino	New Jersey
Cesar Fajardo Martinez	Puerto Rico
Jacob Miller	Pennsylvania
René Mini y Rodriguez	Cuba
Francis J. Monaghan	Connecticut
Cornelius A. Mundy	Pennsylvania
Matthew Park, Jr.	Pennsylvania
Clayton E. Phillips	Pennsylvania
Joseph M. Purcell	Pennsylvania
Matthew K. Quinn	Pennsylvania
Edward F. Rabe	Massachusetts
Nathan Raff	New Jersey
Ralph E. Raker	Pennsylvania
Frederick W. Richardson	Maine
Leo V. Robbins	Maine
Maurice M. Rose	Pennsylvania
Benjamin Rosenthal	New York
Blas A. Russo	Santo Domingo
Francisco Sarria, Jr.	South America
Kassel C. Siegel	Pennsylvania
Joseph F. Sheridan	Pennsylvania
Thomas J. Shore	Pennsylvania
Louis Shrallow	Pennsylvania
Morris N. Silnutzer	Pennsylvania
John J. Siuda	Pennsylvania
Theodore J. Small	Connecticut
Howard M. Smith	Pennsylvania
John W. Snyder	Pennsylvania
Herbert R. Storr	New Jersey
Clarence P. Sullivan	Massachusetts
Louis Sugarman	Pennsylvania
Uichiro Suzuki	Japan
Edward S. Talbot, Jr.	Massachusetts
Edmund J. Thomas	Pennsylvania
Floyd N. Wagner	Pennsylvania
John A. Walsh	Connecticut
Louis L. Weinberg	Connecticut
Ambrose A. Whalen	Pennsylvania
Franklin P. Whitman	Pennsylvania
Earl R. Worner	New Jersey

Degree conferred (as of class of 1916) November 2, 1916:

Joseph B. Casey	Connecticut
Stanley A. DaCosta	Jamaica

Laval University, Dental School.

At the commencement exercises of Laval University Dental School, Montreal, Can., the degree of Doctor of Dental Surgery was conferred on the following graduates:

Emile Beaulieu
Georges Bruchési
Isaie Chalifoux
Théophile Côté
Denis Forest
Gaston Guillemette
Arthias Heynemand
Roméo Lalonde
Ernest Lapointe
Roméo Laporte
G. O. LeBlanc
Albert Leduc
Alphonse LaRocque
Hewitt McLaren
Moras Manseau
Armand Marcoux
Jean Marcoux
Armand Massicotte
Wilfrid Monet
Alfred Ouimet
Raymond Robillard
C. E. Valiquette
Edouard Warren

The degree of Bachelor of Dental Surgery was conferred on the following graduates:

Albert Béland
Finlay Bourgeois
J. H. D. Champagne
J. A. Côté
Eucharíste Cournoyer
James Charpentier
A. L. Ladouceur
Wenceslas Lebrun
J. E. Laforest
André Lessard
René Lavallée
O. A. Léger
Ivan Labelle
Anselme Roy
Rosaire Roy
Lionel Robert
Henri Saintonge
Albert Scheffer
J. A. Thibaudeau

College of Physicians and Surgeons.

At the annual commencement exercises of the College of Physicians and Surgeons, held on June 7, 1917, in San Francisco, Cal., the degree of Doctor of Dental Surgery was conferred on the following graduates:

Edilberto A. G. Anderson	Peru
H. Otto Apt	Ohio
Agnes M. E. Bayley	California
Raoul H. Blanquie	California
Fred E. Boulton	California
John C. Brauer	California
James F. Browne	Ireland
Frederic R. Carfagni	California
Jefferson Citron	California
Ruth A. Craven	California
Matthew R. Crooks	California
John J. Dennis	California
Cyrus C. Donahue	California
Willis B. Danford	California
Edgar L. Dow, Jr.	California
Earl T. Dykes	California
Arthur F. England	California
Joseph A. Flynn	California
John P. Forde	California
Clarence Garcia	California
Clifford S. Goldstone, LL.B.	California
Charles F. Gray	California
Frank G. Grimwood	California
Joseph A. Guild	California
William E. Haslehurst	California
Ambrose P. Heaney	California
Carl F. Hogue	California
Edward B. Howell	California
Maxwell M. Jacobs	California
Marion R. Knoph	California
John L. Koegel	California
Chester F. Lasell	California
George B. Lemon, Jr.	California
David B. Levin	California
Norman M. MacKenzie	California
Arthur R. McDowell	California
Archie T. McGuiness	California
Elmer C. O'Connell	California
Katsuziro Onizuka	Japan
Raymond B. Orpin	California
George Oulton	California
Russell R. Payne	California
Harold H. Peck	California
Frank R. Prince	California
Robert C. Prosek	California
Herbert F. Raynaud	California
Otto E. Reichenbach	California
George B. Reeve	California
Howard J. Sand	California
Emil W. Schernstein	California
George A. Selleck	California
Samuel D. Selleck	California
George R. Smith	California
Katsuyori Soejima	Japan
Marshall B. Stewart	California
Harry G. Storey	Washington
Clarence M. Taber	California
John G. Terzian	Armenia
Horace U. Tyler	California
Andries H. Van Eck	Holland
Charles A. Wall	California
Paul J. Ward	California
Nobukichi Watanabe	Japan
Frederick T. West	California
Carl E. Widing	California
Fannie H. Williams	California
Tomiichi Yamamoto	Japan
Lorin R. Yelland	California

College of Dental and Oral Surgery of New York.

The annual commencement exercises of the College of Dental and Oral Surgery of New York were held in Carnegie Hall, New York City, on Tuesday, June 5, 1917.

The valedictorian was Nelson T. Shields, Jr., Ph.B., D.D.S. The address to the graduates was delivered by Rev. Elliott W. Brown, D.D.

The degree of Doctor of Dental Surgery was conferred by Mr. John W. Boylston, vice-president of the board of trustees, on the following graduates:

Samuel Abraham	New York
Seymour Adolph	New York
Joseph G. Albert	New York
Herman Amolsky	New York
John E. Anderson	New York
Maurice S. Appel	New York
Harry Barrel	New York
John J. Barrett, Jr.	New York
David Bellinson	New York
Solomon I. Bellinson	New York
Pauline Berger	New York
Abraham Bernstein	New York
Benjamin B. Bernstein	New York
Saul Beyers	New York
Edmund Branower	New York
Louis Brave	New York
Lawrence L. Bryant	New York
Malcolm W. Burckard	New Jersey
Irving H. Cantor	New York
Alexandra H. Chalupski	New York
Aaron Church	New York
Isidor A. Cohan	New York
Harry Cohen	New York
Joseph J. Cohen	New York
Rose Cohen	New York
Nadir H. Cooper	New York
Louis A. Corbin	New York
Nestor A. Cretin	New York
Philip M. Dale	New York
Harry Debover	New York
Benjamin Deutsch	New York
Celia Dickman	New York
Frank J. Doyle	New York
Benjamin Dunaif	New York
George A. Economides	New York
Jacob Edelman	New York
Frank Entwistle	New York
Harry Epstein	New York
Nathan Esrig	New York
Charles Fabricant	New York
Harry J. Feldman	New York
Benjamin Fellman	New York
Louis A. Finkelstein	New York
Ray B. Finney	New Jersey
Louis Fisch	New York
Peter N. Fisher	New York
Helen Flanzig	New York
Samuel M. Frank	New York
Chauncey B. Fry	New York
Aloysius R. Gafney	New York
Solomon C. Gardner	New York
Walter D. Gober	New York
David A. Godnick	New York
Samuel Goldhaber	New York
William V. Goldsand	New York
Benjamin Gottlieb	New York
Moses Gottlieb	New York
John Grega, Jr.	New York
Paul Grindlinger	New York
Solomon H. Grobstein	New York
Abel V. Haber	New York
Russell H. Hait	New York
Olga Halpern	New York
Jack D. Hanania	New Jersey
Theodore E. Hanson	New York
Henry G. Harvitt	New York
Tracy K. Healy	New York
George Heimlich	New York
Nathan Helfand	New York
Julius Heyman	New York
William D. Hinman	New Jersey
Otto C. Hoffman	New York
Samuel Hollenberg	New York
Arthur Isaacs	New York
Bernard Jacobs	New York
Jacob Jacobs	New York
Herbert O. Josephson	New Jersey
Edward Kahn	New York
Theodore Kaletsky	New York
Edward Kallman	New York
Aaron Kaplan	New York
Hyman Katz	New York
Feiga Kazmann	New York
Arthur Klein	New York
Joseph M. Klein	New York
Meyer D. Knower	New York
Emma Koch	New York
Julius Korman	New York
Murray A. Koslin	New York
Leo Kossow	New York
Harry A. Krieger	New York
Samuel B. Krohn	New York
Lawrence Kurland	New York
Rose Kutner	New York
William Landsman	New York
Abraham H. Lanes	New York
Thaddeus A. Langan	New York
Michael J. Lapin	New York
Bernard B. Lessell	New York
Aaron Levitt	New York
Chauncey F. Levy	New York
Robert A. Lewis	New York
A. Benjamin Lieberman	New York
Leo Linet	New York
Barney Lipman	New York
Irving Lipschultz	New Jersey
Albert Lorber	New York
Samuel Lubalin	New York
Charles S. Manes	New York
Ernest A. Meinecke	New York
Isidore Mesnicoff	New York
Harry Metliz	New York

Perry Miller	New York
William R. Miller	New York
Charles Milman	New York
William J. Moffett	New York
Leonard Moress	New York
Julius Muscott	New York
Julius S. Nayfack	New York
Clifton A. Norman	New York
Max Ohlbaum	New York
George W. Overton	New York
Robin E. Parks	New York
Samuel Pemsler	New York
Ernest J. Penfield	New York
Isaac Perlstein	New York
Jack D. Phillips	New York
Ben E. Pleshette	New York
Philip Pocker	New York
Leon Polonsky	New York
Simeon H. Pottinger	New York
Jessie E. Powelson	New Jersey
Isidor H. Press	New York
Benjamin J. Pressman	New York
Maximilian Reicher	New York
Nathan Relkin	New York
Alter S. Resler	New York
Bruno O. Restin	New York
George Rivkin	New York
Herman Rodnick	New York
Daniel Rosenberg	New York
Philip Rosenbliett	New York
Morris L. Rosenblum	New York
Rebecca Rosenstein	New York
Frank Rosenzweig	New York
Lillian B. Rosinoff	New Jersey
Herman Rotner	New York
Joseph C. Ruggier	New York
Marie Salutsky	New York
Harold Sappey	New York
Harry P. Schacher	New York
Isaac Schmidt	New York
Eberhardt A. Schminke	New York
Otto A. Schramm	New York
Florence E. Schroeder	New York
Anna L. Schwager	New York
Benjamin Schwartz	New York
David H. Schwartz	New York
Irving I. Schwartz	New York
Solomon Schwartz	New York
Joseph Sheffer	New York
William W. Shepard	New York
George W. Shera	New York
William T. Sherman	New York
Nelson T. Shields, Jr.	New York
Sturges B. Shields	New York
William Simone	New York
Robert D. Skelly	New York
Leo Sobol	New York
Aaron M. Solomon	New York
Harry D. Solomon	New York
Morris Solomon	New York
Pauline Spinner	New York
Stanley G. Standard	New York
Nicholas Stark	New York
Samuel A. Sternberg	New York
Morris Stoller	New York
Sigurd Stoveland	New York
Warren L. Swift	New York
Max Tart	New York
Edmund H. Taylor	New York
Joseph Terdiman	New York
Elizabeth V. Tonkonogy	New York
Charles Wallach	New York
Colby C. B. Waller	New York
William Wasserman	New York
Rose Weber	New York
Jefferson J. Weishaar	New York
Samuel Weitzman	New York
Herman W. Welkowitz	New York
Irving Wien	New York
Eugene C. Williams	New York
Sidney G. Williams	New York
William G. Williams	New York
David Wolf	New York
Ida Zalkin	New York
Meyer H. Zeitel	New York
Jacob M. Zinn	New York

Western Reserve University, Dental School.

The twenty-fourth annual commencement exercises of Western Reserve University Dental School were held in Cleveland, Ohio, on June 14, 1917.

An address was delivered by Albert Shaw, editor of *American Review of Reviews.*

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Stephen A. Bader
Robert A. Buchman
Clarence E. Cheeks
Russel J. Cook
Moss J. Cramer
Asa W. Dean
Helen S. Englander
Michael J. Ferencz
Leroy E. Hanson
Clifford R. Hoffman
Harold E. Horsley
Charles J. Howell
Helen R. Hunt
Luzerne G. Jordan
Louis O. Knapp
Morris J. Lazerick
Benjamin J. Licht
Charles W. Lybarger
Thomas J. McDermott
Joseph L. Mann
Charles A. Masek
Harry B. Mehler
Harry C. Morrow
Franklyn W. Nowak
Philip S. Osgood
Francis X. Owsiak
David A. Rosenberg
George O. Shapero
Sarah L. Steinsapir
William J. Sterling
Harold O. Stern
Morris Stolmack
Isamu Takeda
William Volk
Harold M. Warne
Marcus F. J. Wielage
Harry W. Wise
George N. Wisner

New York College of Dentistry.

At the annual commencement exercises of the New York College of Dentistry, held in New York City, on June 11, 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Meyer Altschuler	New York
Samuel Andres	New York
James S. Anzel	New York
Israel Applebaum	New York
Jacob Arias-Cohen	New York
Jacob Aronson	New York
Boris Aserinsky	New York
Moses Ausübel	New York
Solomon M. Avstreih	New York
Harry Barishman	New York
Samuel Bass	New York
William Bedworth	New York
William J. Beissel, Jr.	New York
Sigmund Beldegreen	New York
Bernard Berkowitz	New York
Emil W. Beyer	New York
Samuel Birenbach	New York
William S. Blatt	New York
Benedict Bloch	New York
Isidore Bloom	New York
Hyman Bodner	New York
Harry Bomelstein	New York
Julian M. Bondy	New York
James Boorlak	New York
Herman D. Borowitz	New York
Joseph Boyunkansky	New York
J. A. Brand	New York
Charles S. Braunstein	New York
William C. Brown	New Jersey
Haim Bruchstein	New York
John B. Bruns	New Jersey
Harry Bushel	New Jersey
Lester R. Cahn	New York
Benedict Carlin	New York
Leslie Carson	New York
John Checchi	New York
Louis Chinich	New Jersey
Abraham G. Coghan	New York
Abraham Cohen	New York
Abraham C. Cohen	New York
David Cohen	New York
Max Cohen	New York
William O. Cohen	New York
Samuel L. Crasson	New York
Ernest C. Dahlman	New York
Julius Daiches	New York
Joseph Davis	New York
Frank X. De Sevo	New Jersey
Demetrius C. Deukmedji	New York
Louis H. Diaz	New York
Manoog Dishian	New Jersey
Harry Drespel	New York
Doria A. D. Ebel	New York
Max D. Eder	New York
Morton H. Ehrmann	New York
Alexander Falk	New York
Jacob Fanwick	New York
Morris Feinberg	New York
Sidney Feldman	New York
Max H. Figur	New York
Victor Fiorentino	New York
Herman H. Firestone	New York
Carl Freyer	New York
Abraham Friedman	New York
Herman J. Friedman	New York
Maurice Friedman	New York
Louis Garfield	New York
Max A. Geller	New York
Hyman Ginsburg	New York
Samuel Glaseroff	New York
Aaron J. Globus	New York
Morris Golden	New York
Moses Goldfarb	New York
Abraham R. Goldschein	New York
Benjamin L. Goldstein	New York
Harry Goldstein	New York
Ralph Goldstein	New York
David Gottfried	New York
Harold G. Graham	New York
Arthur L. Green	New York
Harry Green	New Jersey
Jacob Greenberg	New York
Samuel Greenstein	New York
Harold Grodberg	New Jersey
Morris E. Gross	New York
Joseph Grubman	New York
Martin M. Grünberg	New York
William H. Harris	New York
Walter S. Heard	New York
Emanuel Heftler	New York
Joseph Herman	New York
Morris Herschbein	New York
Howard V. Holahan	New York
William F. Hopkins	New York
Jack Horowitz	New York
William Horowitz	New York
Sidney E. Hyman	New York
Charles L. Hyser	New Jersey
Sidney Iason	New York
Benjamin L. Jacobs	New York
Louis Jacobs	New York
Willis L. James	New York
George Joblove	New York
Irving C. Kaminester	New York
Max Kaminsky	New York
William Karmiol	New York
Irving Kessler	New York
Leo Kestenbaum	New York
Samuel Kirschenbaum	New York
Alexander Klein	New York
Samuel A. Klein	New York
Nathaniel W. Kleinman	New York
Isaac Kloomok	New York
Herman J. Kornbluh	New York
Benjamin Kornfeld	New York
Emanuel M. Kramer	New York
Albert Kreitman	New York
Joseph B. Kronenberg	New York
Bernard Kurlantzick	New York
Samuel Laitin	New York

Isidor E. Langner	New York
George Leder	New York
Abraham Levine	New York
William Levitien	New York
Saul Levy	New York
Joseph Lief	New York
Israel Linder	New Jersey
Louis Livowitz	New York
Frederick H. Loeffler	New Jersey
Leo G. Lourie	New York
Robert C. Lowrie	New York
William M. Lubitz	New York
Morris Mandel	New York
Louis L. Mann	New York
Arthur Marcus	New York
Victor Mautner	New York
Samuel Messinger	New York
Karl H. Metz	New York
William Mindlin	New York
Martin M. Mitchell	New York
Max A. Munblatt	New York
Nathaniel Nathanson	New York
Moses M. Nechamkin	New York
Irving Needle	New York
Jacob Novikoff	New York
Maxwell J. Oling	New York
Alexander Paigen	New York
Max Pilzer	New York
Abraham Pollikoff	New York
Charles Radack	New York
Philip Rand	New York
Edward I. Reff	New York
Abraham Reisfeld	New York
Leo Remes	New York
Reuben Richman	New York
Harry S. Robinson	New York
Oscar Rodin	New York
Frank Röhr	New York
Abraham M. Rosenberg	New York
Samuel H. Rosenhaus	New York
Edward E. Rosenthal	New York
Benjamin H. Rost	New York
Julius J. Rothman	New York
Isidore M. Rowitt	New York
Otto Sachs	New York
Lazarus Sapolsky	New York
Edward N. Sarath	New York
Frank Saxe	New York
Eli L. Schaaf	New Jersey
Harry Schantz	New York
Norbert Schoenberg	New York
Irving Schuman	New Jersey
David W. Schwaid	New York
Benjamin Schwartz	New York
Harry Schwartz	New York
Jacob W. Schwartz	New York
Joseph P. Schwartz	New Jersey
Philip L. Schwartz	New Jersey
William Schwartz	New York
Joseph Seebal	New York
Philip Seidel	New York
Ralph Shaftan	New York
Max S. Shapiro	New York
Saul Shapiro	New York
Israel Shoben	New York
Harry Shwalb	New Jersey
Maxwell Silverstein	New York
Hamilton D. Smith	New York
Henry L. Smokler	New York
Harry M. Smolinsker	New York
Max Smul	New York
Samuel H. Solomon	New York
Louis L. Spaet	New York
Isidor Spenadel	New York
Leo Spivak	New York
Harry Steigman	New York
Frederick Stein	New York
Louis Sternberg	New York
Victor Stoll	New York
Jacob Sturtz	New York
Abraham L. Sussman	New Jersey
Irving W. Teitelbaum	New York
Edward C. Tillman	New York
Maurice Trattler	New York
Abraham J. Ullman	New York
Otto Urban	New York
Samuel Wagman	New York
Samuel Wallman	New York
Bernhard Warlin	New York
Leon H. Wayman	New York
Barnet Weinerman	New York
Sidney Weissbach	New York
Jacob A. Weissburg	New Jersey
Francis M. Wells	New York
Philip Welsh	New York
Harry Wigdor	New York
Dwight R. Wilson	New York
Philip Zahn	New York
Armand C. R. Ziegler	New York
Richard Ziegler	New York
Carl J. Zorn	New York
Morris Zucker	New York
Baer Zuckerbraun	New York

Tulane University, School of Dentistry.

At the annual commencement exercises of Tulane University School of Dentistry, held in New Orleans, La., in June 1917, the degree of Doctor of Dental Medicine was conferred on the following graduates:

Alney Austin	Mississippi
Anthony Bacigalupi	Louisiana
Dario B. Clemente	Cuba
Edgar W. Hungate	Texas
Felix M. Isaacson	Louisiana
Pierre O. Landry	Louisiana
William D. McArthur	Florida
Levi H. Magee	Texas
David M. Prowell	Louisiana
Robert Rubinstein	Louisiana
Russell A. Thompson	Louisiana
James A. Wainwright	Louisiana

George Washington University, Dental School.

THE ninety-sixth annual commencement exercises of George Washington University Dental School were held in the Central high school auditorium, Washington, D. C., June 6, 1917.

Addresses were delivered by Hon. Wm. M. Collier, A.M., and by President Stockton.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Clarence B. Allen	Pennsylvania
Lawrer W. Bowen	Colorado
Munn Q. Cannon	Utah
S. O. Claytor	Ohio
Edward J. Copping	Maryland
Merle E. Donahey	Pennsylvania
Frank W. Douglas	Florida
John L. Elliott	Maryland
Milton Forman	Wisconsin
Leon Frost	Ohio
Patrick Gallagher	Ireland
George F. Goetzman	Wisconsin
Seiichi Katayama	Japan
George W. Lady	Ohio
Daniel S. Lockwood	Illinois
Leah Minkin	District of Columbia
William I. Ogus	Massachusetts
Frank G. Porter	Iowa
Claude M. Postlewait	Illinois
James I. Root	Michigan
Walter F. Sullivan	Pennsylvania
Toshio Tahara	Japan
Frederick D. Woods	District of Columbia
Webb W. Wyman	Ohio
Festy Yoakum	West Virginia

Baltimore College of Dental Surgery.

AT the annual commencement exercises of Baltimore College of Dental Surgery, held in Baltimore, Md., in May 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

H. J. Adams	Connecticut
W. S. Adams	Massachusetts
A. M. Aucoin	Nova Scotia
J. E. Barker	Connecticut
A. A. Beausoleil	Rhode Island
W. E. Berube	Maine
T. J. Bland	Virginia
J. R. Brinham	Pennsylvania
J. L. Carmony	Maryland
C. M. Clark	New York
L. A. Clarkson	New Hampshire
S. B. Clovis	Pennsylvania
O. J. Cormier	New Brunswick
W. N. Crowl	Massachusetts
J. R. Davis	Maryland
J. P. Dewhurst	Massachusetts
M. A. Dorion	Canada
T. Fitzsimmons	Pennsylvania
G. M. Ganun	New York
J. F. Gildea	New York
H. B. Himmelman	Canada
L. W. Hoffman	Maryland
F. J. Houghton	New Jersey
W. J. Hutchinson	New Jersey
E. B. Jackson	Pennsylvania
E. J. Jacques	New Hampshire
J. A. Jernigan	North Carolina
J. F. Keeley	Massachusetts
W. H. Kennedy	Canada
A. B. King	Maryland
R. A. Knowles	Massachusetts
H. J. Lafferty	Massachusetts
J. C. Light	New Jersey
W. W. Luce	Canada
H. W. McCaw	Pennsylvania
R. H. McKinnon	Massachusetts
F. S. Maier	Maryland
F. F. Manning	British West Indies
E. Marchl	Pennsylvania
J. B. Montano	Connecticut
R. R. Moon	Massachusetts
J. Morales	Florida
H. S. Morrisette	Virginia
M. E. Mullen	Connecticut
W. G. Norman	Virginia
W. O'Connor	Connecticut
M. J. Paugh	West Virginia
J. P. Poirier	Canada
R. E. Poulin	Maine
B. R. Ratner	Massachusetts
S. A. Reed	New York
W. H. Ricketts	New Jersey
V. H. Roca	Cuba
M. Rosenthal	Massachusetts
A. Sheppe	West Virginia
C. R. Sturm	Maryland
A. G. Tillman, Jr.	Mississippi
J. E. Tyler	Massachusetts
O. S. Waldrop	North Carolina
L. A. Walzak	Pennsylvania
B. Wernick	Connecticut
H. C. Witham	Maine
E. R. Wolfe	Maryland

Western Dental College.

At the annual commencement exercises of Western Dental College, held in Kansas City, Mo., the degree of Doctor of Dental Surgery was conferred on the following graduates:

L. L. Bevensee
L. D. Blanchard
S. J. Blum
A. J. Bock
O. W. Boyer
E. L. Braddock
E. Y. Casey
J. T. Casper
R. L. Casper
A. M. Crowder
L. E. Davidson
J. F. Deveney
E. L. Dillon
F. H. Doty
H. D. Edwards
B. Garner
O. B. Gentry
R. H. Gerard
E. D. Gilbreath
M. A. Gillgannon
J. R. Gordon
V. H. Grinstead
R. C. Gwin
H. L. Harris
N. Helstern
L. C. Hendrick
W. A. Howell
W. D. Howell, Jr.
W. R. Jackson
D. A. McKellar
H. L. Maness
J. B. Markham
J. L. Morton
O. C. Mount
G. W. Perkins
W. L. Poynor
H. G. Pratt
E. E. Ramsey
E. H. Sanders
A. F. Schopper
R. N. Scruby
R. E. Schulz
E. L. Sherrow
W. C. Shull
W. B. Stewart
I. M. Swaim
A. H. Tholen
L. R. Townley
A. R. Trimble
F. B. Walters
W. W. Warriner
H. J. Warta
H. R. Webster
B. C. Wright

University of Iowa, College of Dentistry.

The thirty-fifth annual commencement exercises of the University of Iowa College of Dentistry were held in Iowa City, Iowa, on June 13, 1917.

An address was delivered by Commissioner F. C. Howe, Ph.D., New York City.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Arthur P. Alexander	Kansas
John W. Altfillisch	Iowa
Arthur F. Austin	Iowa
Manuel Bane	Iowa
Alexander Bastron	Nebraska
William H. Beshears	Missouri
Fred Bracewell	Iowa
Lorenzo Brooks	Iowa
Archie R. Butterfield	Iowa
Don C. Camblin	Iowa
Marc R. Carey	South Dakota
Sam V. Carpenter	Iowa
Hal E. Clough	Iowa
Edward J. Cobb	Colorado
Charles C. Colgan	Iowa
Clarence C. Collis	Iowa
Roger W. Dauffenbach	Wisconsin
Leroy L. De Yarman	Iowa
C. Lawrence Drain	Iowa
John W. Elbert	Wisconsin
Arentz J. Ericson	Iowa
Hadley H. Ervin	Iowa
Stanley G. Ewen	Iowa
Harris B. Frampton	Iowa
Minnie M. Frydenborg	Iowa
Clark J. Gilmore	Iowa
Forrist V. Haley	Iowa
Clint H. Harrison	Iowa
Ivan S. Hasek	Iowa
Cletus T. Hays	Missouri
Rolland H. Jacoby	Iowa
Louis Kadesky	Iowa
Walter J. Kelson	Iowa
Loran L. Kline	Iowa
Marion O. Knapp	Iowa
Melvin J. Knodle	Iowa
Masao Kubo	Hawaii
Clifford R. Lanphere	Iowa
Peter P. Laude	Iowa
Harry L. Leedham	Iowa
Edmund F. Lieb	Minnesota
Joseph C. McGinley	Iowa
Max M. Mills	Iowa
Francis H. Molyneux	Iowa
C. Roger Mooney	Wisconsin
Harry O. Moore	Iowa
J. Milnor Murphy	South Dakota
Cleo Nichols	Iowa
Ray W. Noland	Iowa
Johnson A. Nye	South Dakota
Herbert E. Nygren	Minnesota
Harold R. O'Dell	Iowa
William O'Neill	Iowa
Oran K. Parrott	Iowa
Alfred L. Petersen	Iowa
Harry B. Pinneo	Iowa
Cyrus S. Ranck	Illinois
Max E. Reinking	Colorado
Paul W. Richardson	Iowa
William H. Rohrbaugh	Iowa
William D. Scott	Iowa
Junior M. Smith	Iowa
J. Cletus Stanton	Iowa
Arthur E. Sterling	South Dakota
Rodman E. Taber	Iowa
Alfred J. Tanner	Iowa
Barnett A. Wallman	Iowa
George R. Whisler	Nebraska
Elroy White	Iowa
Merle E. Whiteside	Iowa
Otis G. Whitney	Iowa
W. Glen. Whitney	Iowa
Almer B. Wigdahl	Iowa
John R. Wikeen	Minnesota
Charles R. Willson	South Dakota
James E. Wright	Iowa
Joseph Zadrazil	Iowa

Cincinnati College of Dental Surgery.

THE annual commencement exercises of the Cincinnati College of Dental Surgery were held at the Business Men's Club, June 1, 1917.

Addresses were made by Prof. E. W. Wilkinson, president of the board of trustees, Dr. G. S. Junkerman, dean, and Dr. Marion Seiler, class orator.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Chester G. Belknap	Ohio
Max W. Braun	Ohio
Ray F. Coleman	Ohio
J. W. Dixon	Kentucky
Cloyd H. Felix	Ohio
Glenn L. Freed	Ohio
James T. Heavern, Jr.	Kentucky
Leslie Ireton	Kentucky
Wilfred E. James	Ohio
Ralph D. Keightley	Illinois
John E. Rosenthal	Ohio
Louis Rosenthal	New Jersey
Marion Seiler	Ohio
James L. Sparks	Ohio
Elmer W. Switzer	Michigan
Charles G. Townsend	Kentucky
Harry D. Watkins	Ohio
Harold K. Williams	Michigan

St. Louis University, Dental Department.

THE annual commencement exercises of St. Louis University Dental Department were held on June 9, 1917, in St. Louis, Mo.

The commencement address was delivered by Hon. David I. Walsh.

The degree of Doctor of Dental Surgery was conferred by the president of the university on the following graduates:

Charles E. Beerup	Illinois
Maurice L. Brown	Missouri
Ray L. Buchanan	Missouri
Roy S. Bucy	Arkansas
Anthony C. Burian	Missouri
Frena L. Casey	Illinois
Ernst L. Casselman	Illinois
Archie W. Chamberlain	Missouri
Clifford C. Chesterson	Indiana
Leslie T. Conditt	Missouri
Perley M. Cunningham	Illinois
Charles L. Eales	Missouri
Leo Epstein	Missouri
James W. Ford	Illinois
Arthur T. Gaertner	Missouri
Druey Goodman	Missouri
John M. Gorman	Kansas
James H. G. Grimaud	Missouri
Albert R. Hammen	Missouri
Newton R. Hatfield	Missouri
Joaquin A. Heck	Spain
Elmer A. Heinz	Illinois
Joseph J. Heithaus	Missouri
Andrew W. Herington	Missouri
Roy C. Hoel	Illinois
Russell A. Hollers	Missouri
Benjamin Huber	New York
Lester C. Hunt	Illinois
John H. Kelley	Missouri
Iwao Kiyokawa	Japan
Leland N. Kuykendall	Illinois
Harry R. Locke	Illinois
Myrl M. Lumbattis	Missouri
Justin P. McConnell	Illinois
Leo F. Marre	Missouri
James T. Moffitt	Kansas
Paul J. Murphy	Missouri
Joseph L. Noecker	Missouri
Arthur L. Nygard	Washington
Harry E. Olmsted	Missouri
Jesse Patterson	Arkansas
Elmer S. Peterson	Wisconsin
Henry C. Quick	Missouri
William H. Radentz	Missouri
Jerome A. Rapp	Illinois
Earl H. Reel	Illinois
John C. Rhodes	Missouri
Floyd C. Roadhouse	Kansas
Charles C. Robinson	Nebraska
Thomas C. Rockwood	Missouri
George B. Scott	Missouri
Joseph Solomowitz	Missouri
Charles W. Struckmeyer	Missouri
Orlin C. Stuart	Missouri
Francis C. Sullivan	Missouri
Kiyoshi Takeda	Japan
Raymond L. Teich	Missouri
Francis J. Temme	Missouri
Charl J. Torrence	Missouri
Charles McC. Watson	Missouri
Charles W. Wekenman	Illinois
Rudolph J. S. Wild	Missouri
Rolla I. Witty	Illinois
Stanley A. Wynn	Illinois
Jacob H. Zercher	Illinois

Vanderbilt University, School of Dentistry.

The annual commencement exercises of the School of Dentistry, Vanderbilt University, were held on May 31, 1917, in Nashville, Tenn.

The address to the graduates was delivered by Rev. H. J. Mikell.

The degree of Doctor of Dental Surgery was conferred by the chancellor, James H. Kirkland, A.M., Ph.D., LL.D., on the following graduates:

Murrell W. Anderton	Tennessee
William M. Blair	Arkansas
Edwin S. Brannon	Alabama
Thomas E. Cecil	Tennessee
Marion A. Childers	Texas
Thomas H. Cleveland	Alabama
Leslie B. Craig	Tennessee
Samuel E. Crawford	Tennessee
Percy M. Davis	Kentucky
Henry G. Eubanks	Mississippi
James R. Fleming	Tennessee
Harry M. Gallagher	California
Clive L. Hall	Alabama
Charles E. Harris	Tennessee
James T. Hervey, Jr.	Kentucky
Bennett C. Holder	Texas
Euphra C. Hubbs	Kentucky
Eugene S. Kane	Texas
Avery E. Kolb	Mississippi
Benjamin W. McCrary	Arkansas
John A. McDonald	Texas
A. Milton McWhorter	Alabama
Joe H. Morris	Tennessee
Ewing M. Oglesby	Florida
William L. O'Quinn	Texas
Charles E. Porter	Tennessee
Milo D. F. Rathburn	Michigan
Max V. Sigal	Tennessee
Henry G. Simpson	Alabama
Richard T. Simpson	Tennessee
Alexander M. Smith, Jr.	Florida
William J. Tichenor	Tennessee
Winson G. Trulock	Texas

University of Buffalo, Dental Department.

At the annual 1917 commencement exercises of the Dental Department, University of Buffalo, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Leon L. Abbey	New York
David W. Beier	New York
Dan C. Bennett	New York
Murray A. Bond	New York
Albert H. Boysen	New York
Edward P. Burns	New York
Howard W. Chase	New York
Leland R. Crawford	New York
Lyman De La Mater	New York
Lawrence F. Dietter	New York
Edward J. Doran	New York
Harold E. Dorn	New York
Albert C. Dumke	New York
Walter C. Ervin	New York
Victor M. Fairchild	New York
Howard K. Faller	New York
Leon B. Foote	New York
Arthur F. Gehrman	New York
Chester P. Glor	New York
Samuel Goldberg	New York
Gustav M. Gramlich	New York
Joseph L. Guzzetta	New York
Wilfred H. Hall	New York
Charles E. Hastings	New York
Joseph R. Hawn	New York
Raymond C. Herman	New York
Harold H. Hickey	New York
Joseph H. Hickey	New York
Leyetta L. S. Hobin	New York
Claude H. Hunter	New York
Charles C. Ianne	New York
Tracy E. Jones	New York
Emaris L. Jones, Jr.	New York
Annie R. King	Massachusetts
Isaac Klein	New York
Morris Klein	New York
Hubert C. Knight	New York
George W. Korn	New York
Wilmurt C. W. Kronmiller	New York
Edward F. Larkin	New York
Hilliard A. McKinley	New York
Henry A. McMahon	New York
Paul A. Martin	New York
Kenneth W. Moore	New York
Elmer J. Pammenter	New York
Stanislaus Pantera	New York
William C. Penrose	New York
Harold J. Quigley	New York
Christian Schuster	New York
Anna R. Shapiro	New York
John L. Shaw	New York
Walter H. Smith	New York
George C. Steigerwald	New York
Carlton L. Tague	New York
Irving N. Troup	New York
Daniel J. Walker	New York
Carl W. Weber	New York
Herbert A. White	New York
James G. Woodworth	New York
Edwin Zackem	New York

Kansas City Dental College.

At the thirty-sixth annual commencement exercises of Kansas City Dental College, held in the First Presbyterian Church, May 26, 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Harry A. Allshouse, Jr.
George M. Arrowsmith
Charles H. Bailey
Charles M. Bailyn
Kenneth A. Benson
Clarence A. Bohl
James A. Brown
Cedric A. Cheek
Stafford I. Copeland
Noble J. De Vore
Robert Y. Dix
Alva O. Elliott
Howard L. Ericson
Harry W. Everett
Henry M. Farrell
James M. Feild
Ralph E. Gerstenkorn
Paul P. Greusel
Clair B. Hall
William E. Harms
Edward F. Johnson
Noah W. Johnston
Federico L. Kampitan
John D. Kennedy
Harry L. Lacy
Hoover B. Lamborn
Vere Lane
Frank D. Logsdon
Harry H. Lowry
Harold T. Lucas
Frank H. Luckinbill
Lora T. Melton
Don A. Miller
William R. Montgomery
Joseph D. Moon
William A. Moore
John S. McElroy
James C. McCroskey
Goroku Nakamura
Franz W. Olsson
William R. Park
Pressley M. Piner
John R. Potts
William E. Pray
Harry P. Ramage
James J. Rogers
Edward C. Ryan
John C. Saunders
John R. Scott
Mitchell B. Shafer
James M. Shaver
Burnham E. Shaw
James L. Sisson
Raymond O. Smith
Bernard A. Smith
Bernard J. Stucky
Waldo H. Thompson
George W. Tinslar
Joseph G. Tippin
Charles B. Treasure
Ralph E. Wade
Warren S. Whittle
Walter E. Wilson
Walter L. Woody
Lewis J. Wyatt
Charles T. York
Henry C. Zellers

University of Southern California, College of Dentistry.

The commencement exercises of the College of Dentistry, University of Southern California, were held in Los Angeles, Cal., June 7, 1917.

The commencement address was delivered by Bishop Adna Wright Leonard, D.D., LL.D.

The degree of Doctor of Dental Surgery was conferred by George F. Bovard, A.M., LL.D., president of the university, upon the following graduates:

Ralph H. Alexander	California
James E. Armitstead	Utah
Clarence P. Ballard	California
N. Louis Beesemyer	California
Edward W. Blurock	Washington
James C. Bogart	California
Chester H. Brown, Jr.	Michigan
Earl M. Brownson	Colorado
Chauncey R. Casebeer	Oregon
Virgil W. Chatterton	Iowa
Charles Cole	Canada
Arthur G. Cook	Connecticut
Sylvia Covert	British Columbia
Robert F. Critchlow	Pennsylvania
John E. Eames	Missouri
George A. Ellsperman	Washington
Elia C. Epstein	Russia
Franklin B. Foster	Tennessee
Charles G. Gould	Iowa
Clyde O. Greef	Iowa
Forrest W. Gum	California
William E. Guth	California
Ernest J. Hawke	California
John F. Hill	Scotland
Harry V. Holcomb	Kansas
Paul T. Holcombe	California
Jesse M. Howard	California
Lowell B. Hutchason	Indiana
Torazo H. Kurata	Japan
Harry I. Kurisaki	Hawaii
William S. Lackner	Canada
William C. Lardner	California
Reuben Larson	California
James G. Leavitt	California
Jacob C. Miller	Ohio
Francis C. Montgomery	Utah
Treve L. Moon	Missouri
Lancelot P. Nielsen	Utah
Robert F. O'Brien	Illinois
Harry P. Petersen	Denmark
Sandford Purviance	Idaho
Ernest E. Ramsaur	California
Ben L. Reese	Ohio
Don D. Rush	Oklahoma
Leonard Siever	Russia
Ronald B. Slater	Washington
Wesley E. Smith	Utah
Joseph W. Snyder	Missouri
John A. Schwamm	California
Aaron S. Schwartz	Roumania
Jack E. Scruggs	Tennessee
Huse F. Standefer	California
John O. Stoker	Ohio
Harold Straub	Iowa
Elba H. Wessell	Missouri
Herbert A. Whipple	California
Charles H. Williams	Washington

Creighton College of Dentistry.

At the annual commencement exercises of Creighton College of Dentistry, held in Omaha, Nebr., on June 2, 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Melville Babington	Nebraska
Arnold L. Beste	Nebraska
William J. Busch	Nebraska
Earl Conley	Montana
Bernard J. Dugan	Wisconsin
Matthew A. Gillgannon	Nebraska
Adolph J. Kubitschek	Iowa
Asa P. Lambert	Iowa
Harry A. Larson	Nebraska
Verne E. McPherson	Nebraska
Leroy J. Moreton	Idaho
Tom P. Mullins	Nebraska
Mark D. Nelson	Nebraska
Clarence R. O'Leary	Nebraska
Harry T. Ostrum	Minnesota
Harold F. Parish	Nebraska
Roy R. Platz	Nebraska
Raymond D. Reid	Nebraska
Pearl W. Sawyer	Nebraska
Robert H. Schemel	Iowa
Henry A. Schulz	Nebraska
Francis J. Snider	Nebraska
Francis F. T. Theisen	Nebraska
Andrew Thompson	Iowa
Archie B. Utterback	Nebraska
Ernest E. Wise	Nebraska
Ross W. Wood	Nebraska
Lawrence B. Young	Nebraska

NOTICES AND ANNOUNCEMENTS.

Rules Governing the Regulation of the Advertising of Dental Companies

AS ADOPTED BY THE

Board of Regents of the University of the State of New York.

Adopted by the Board of Regents, at a meeting held May 4, 1917, in accordance with Section 203 (*b*) Subdivision 4, Public Health Law. Prohibiting—

1. "Advertising either by sign or printed advertisement under the name of a corporation, company, association, parlor, or trade name; except that legally incorporated dental corporations existing and in operation prior to January 1, 1916, may continue so operating while conforming to the provisions of this act." *(Subdivision 4 of Section 203 of the Public Health Law, as amended by Chapter 129 of the Laws of 1916.)*

2. Advertising personal superiority or ability to perform services in a superior or unusual manner.

3. Advertising definite, fixed prices that, in the very nature of the professional service rendered, must be variable.

4. Advertising statements that might be calculated to deceive or mislead the public.

Adopted by the Board of Regents June 25, 1917:

5. No dental corporation shall display any sign or publish any advertisement concerning its work containing any parlor, trade, or assumed name except its true corporate name. Such signs and advertisements may contain the names of the duly licensed dentists practicing in connection with such corporation. It shall not use any parlor, trade, or assumed name in connection with such corporate name, nor display any sign or publish any advertisement containing any parlor, trade, or assumed name under which the business was formerly conducted except its true corporate name.

Augustus S. Downing,
Assistant Commissioner and Director of Professional Education.

NATIONAL DENTAL ASSOCIATION ANNOUNCEMENTS

ALL MEETINGS, CLINICS (EXCEPT SURGICAL), AND EXHIBITS, TO BE IN HOTEL ASTOR.

Twenty-first Annual Meeting, New York City, October 22-26, 1917.

THE following are additions to the program as already published:

Monday, October 22d.

(Registration: Laurel room, first floor.)

BOARD OF TRUSTEES (first session), 11 A.M.

HOUSE OF DELEGATES (opening), 2 P.M.

BOARD OF TRUSTEES (second session), 4 P.M.

First General Session.

Tuesday, October 23d, 9 a.m.

Invocation.

Address of welcome—Gov. Chas. S. Whitman, Albany, N. Y.

Mayor John P. Mitchel (on behalf of City), New York City.

President's Address—LaFayette L. Barber, Toledo, O.

Oration—E. C. Rosenow, M.D., Rochester, Minn., a research member of the Memorial Institute for Infectious Diseases, Chicago, and Professor of Experimental Bacteriology, Univ. Minnesota, and the Mayo Institute.

Second General Session.

Tuesday, October 23d, 8 p.m.

RESEARCH DEPARTMENT: PATHOLOGICAL, BACTERIOLOGICAL, AND CLINICAL STUDIES.

"Dental Caries." Russell W. Bunting and U. G. Rickert, B.S., M.A. (Work done in and with the assistance of the University of Michigan.)

"A Study of the Pathology of the Peridental Membrane." Frederick B. Noyes. (Work done in and with the assistance of the University of Illinois.)

"The Histo-pathology of Chronic Periodontitis and the Pathogenesis of Dental Root-cysts." Thos. B. Hartzell and Arthur T. Henrici, M.D. (Work done in and with the assistance of the University of Minnesota.)

"A Comparative Study of Oral Focal Infections." Weston A. Price and Milton J. Damlos, D.D.S., Research Institute Laboratories, Cleveland, Ohio.

Third General Session.

Wednesday, October 24th, 8 p.m.

Herbert L. Wheeler, *Chairman*, New York.

DENTAL SURGERY AND RESTORATIVE PROSTHESES IN THE EUROPEAN WAR.

"War Dental Surgery."

"War Dental Restorative Prostheses."

It is expected that Mr. Robert Bacon, ex-ambassador to France, will preside, and that the Surgeons-general of both the army and navy will attend. A description of the work done in Europe will be given by one who has had experience there.

It is anticipated that both the medical and dental professions will be represented.

There will also be pictures of "War Surgery."

Fourth General Session.

Thursday, October 25, 8 p.m.

Chas. H. Oakman, *Chairman*, Detroit, Mich.

ORAL AND DENTAL HYGIENE—MASS MEETING.

"The Importance of Dental Infections as Related to Urinary Tract Diseases, with Particular Reference to Ureter Stricture and Its Sequelæ." Guy L. Hunner, S.B., M.D., Johns Hopkins Univ., Baltimore, Md.

Research Department.

Wednesday, October 24th, 1.30 p.m.

"Root Canal Fillings." John R. Callahan. (Work done in and with the assistance of the Cincinnati General Hospital.)

"Studies upon the Bacteriology of Dental Caries." Percy R. Howe. (Work done in and with the assistance of the Forsyth Dental Infirmary.)

"Quantitative Determinations of Certain Organic Substances in Saliva, and Their Relation to Oral Conditions." John A. Marshall, M.S., D.D.S. (Work done in and with the assistance of the University of California.)

"Electrolytic Medication—Physiological and Dental Aspects." Samuel E. Pond, B.H., A.M., and Weston A. Price, Research Inst. Laboratories, Cleveland Ohio.

Thursday, October 25th, 9 a.m.

CHEMICAL AND METALLURGICAL STUDIES.

"Dental Cements." Marcus L. Ward. (Work done in and with the assistance of the University of Michigan.)

"Progress of the Investigation of Mottled Enamel." Frederick S. McKay, Colorado Springs, Colo.

"Studies of Internal Secretions in Their Relation to the Development and Condition of the Teeth." W. J. Gies, M.D., Ph.D. (Work done in and with the assistance of Columbia University, New York City.)

"The Relative Efficiency of Medicaments for the Sterilization of Tooth Structures." Matilda Moldenhauer, A.B., M.S., and Weston A. Price, Research Inst. Laboratories, Cleveland, Ohio.

Preparedness League of American Dentists.

Tuesday, October 23d, 1.30 p.m.

"The Relations of the Dental to the Medical Corps of the Army." Victor C. Vaughan, M.D., ex-president of the American Medical Association, member General Medical Board, Council of National Defense, Washington, D. C.

"The Value of the Educational Work Effected by the Preparedness League of American Dentists." Frank M. Casto, Cleveland, Ohio.

"Report of Sectional Units of the League by States—A to N inclusive."

Thursday, October 25th, 1.30 p.m.

"Stereopticon Lecture on Fractures of the Bones of the Face." Synopsis: This lecture will include the consideration and treatment of gunshot wounds; removing foreign substances; the sterilization of wounds; the proper adjustment of fragments and the means employed to immobilize them. (In the treatment of injuries of the face, the primary step should be after removing foreign substances to establish, as nearly as possible, asepsis.) The use of grafts of bone, modeling compound, hard rubber, and metals to replace lost parts.

"The Dental Ambulance in War." George B. Hayes, Neuilly (Paris), France.

"Report of Sectional Units by States—M to Z inclusive."

(An interesting Preparedness Exhibit will be shown, including Dental Ambulances, Base Hospital, Field Hospital, and First Aid Equipments; in fact, everything relative to the service of the Officers Reserve Corps, Dental Section, and Red Cross. Officers will be present to give instruction and information. The ambulances shown are to be sent to France as the gift of members of the Preparedness League and appreciative patients.)

Anesthetists Section.

Wednesday, October 24th, 1.30 p.m.

"The Teaching of Local Anesthesia." Theo. Blum, New York City.

"The Relative Toxicity of Local Anesthetics." George B. Roth, Washington, D. C.

"Cause of Failure and Untoward Sequelæ in Conductive Anesthesia." Richard H. Riethmüller, Montclair, N. J. (Illustrated by moving picture film.)

Thursday, October 25th, 9 a.m.

"After-pain in Local and General Anesthesia." A. E. Hertzler, Kansas City, Mo.

"General Anesthesia for Oral Surgery." Herbert A. Potts, Chicago, Ill.

State Society Officers Section.

Wednesday, October 24th, 9 a.m.

"Postgraduate Course." B. L. Shobe, Tulsa, Okla.

"State Legislation from a Dental Standpoint." A. H. Reynolds, Philadelphia, Pa.

"Taking an Invoice of Our State Societies." Otto U. King, Huntington, Ind.

Wednesday, October 24th, 1.30 p.m.

"Organization." J. P. Luthringer, Peoria, Ill.

Symposium—"Method Used in Handling the Mid-winter Dental Clinic, Atlanta Dental Society." Thomas P. Hinman, Atlanta, Ga.; S. M. Cameron, Philadelphia, Pa.; Benjamin

Sandy, Minneapolis, Minn.; Henry L. Whipple, Quincy, Ill.

R. Ottolengui, *Publicity Committee.*

[New York City.]

National Association of Dental Faculties.

The 1917 meeting of the National Association of Dental Faculties will be held at the Hotel Astor, New York City, Friday and Saturday, October 19 and 20, 1917.

The Executive Committee will meet at 9 A.M., and the general session will open at 10 o'clock as usual.

Chas. Channing Allen, *Sec'y*,
N. W. cor. 10th and Troost, Kansas City, Mo.

[New York City.]

Association of Military Dental Surgeons.

The annual meeting of the Association of Military Dental Surgeons of the United States will be held at Hotel Astor, New York City, October 23 to 26, 1917.

J. D. Millikin, *President*,
S. W. Hussey, *Sec'y.*

[New York City.]

Xi Psi Phi Fraternity.

The alumni of the Xi Psi Phi Fraternity will hold a dinner at the Waldorf-Astoria Hotel, New York City, on October 22, 1917.

All the alumni of the fraternity are most cordially invited to attend. For particulars write

J. Nohert Gelson,
282 Park Place, Brooklyn, N. Y.

[New York City.]

Delta Sigma Delta Fraternity.

The thirty-third annual meeting of the Supreme Chapter of Delta Sigma Delta Fraternity will be held in the East ballroom of the Hotel Astor, New York City, Monday, October 22, 1917, at 10 A.M.

The regular order of business will be pursued, to be followed by initiatory exercises in the afternoon.

The headquarters of the Fraternity will be at the same hotel, at which place the annual banquet will be held at 7 P.M. in the North ballroom.

By order of the Supreme Chapter.

R. Ottolengui, *Supreme Grand Master*,
R. Hamill D. Swing, *Supreme Scribe.*

American Society of Orthodontists.

The annual meeting of the American Society of Orthodontists will be held at Excelsior Springs, Mo.—thirty minutes' ride from Kansas City—September 5, 6, 7, and 8, 1917.

The program will be one of the best ever presented by the society. All those interested in orthodontia are invited to attend.

F. M. Casto, *Sec'y*,
Cleveland, Ohio.

Northeastern Dental Association.

The twenty-third annual meeting of the Northeastern Dental Association will be held at the Bancroft Hotel, Worcester, Mass., on September 26, 27, and 28, 1917.

Alvin A. Hunt, *Sec'y*,
Hartford, Conn.

Massachusetts Board of Examiners.

A meeting of the Massachusetts Board of Dental Examiners for the examination of candidates will be held in Boston, Mass., October 2, 3, 4, and 5, 1917, inclusive. All applications must be filed with the secretary ten days before the examination.

George H. Payne, *Sec'y*,
29 Commonwealth ave., Boston, Mass.

National Mouth Hygiene Association.

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ARMY AND NAVY DENTAL NEWS.

Campaign Badges for Dental Corps.

Senator New has introduced a bill (S. 2701) providing for the awarding of campaign badges to the members of the Army Dental Corps, and fixing the regulations for awarding same—as follows:

That the Secretary of War shall issue campaign badges to the members of the dental corps, United States Army, under the same conditions, rules, and regulations which govern the issuance of said badges to the medical corps, United States Army.

"Sec. 2. That in computing the nature of service and length of duration of said service for making the award of said badges to the members of the said dental corps, United States Army, the time said members have served under contract as well as under commission shall be included and form the basis for making the awards of said campaign badges."

Uniform of Army Dental Surgeons.

Interest has been expressed by dental surgeons of the army in regard to the uniform they should wear. Members of the dental branch of the medical department wear the uniform of other officers of that staff corps, with the difference in insignia. The trousers of the dress uniform include the maroon stripe 1½ inches wide with a piping of white cloth ⅛ inch in width on each edge. The full-dress trousers include the gold wire lace, ⅞ inch wide, down the side seam.

Official Information Relative to the Dental Reserve Corps.

Tender of Services.

1. An applicant should fill out his enrollment blank for Dental Reserve Corps, secure two letters of recommendation, and then present himself to the medical reserve officer for physical examination. Upon the completion of the physical examination the applicant presents his application with the two letters attached, and physical examination blanks filled out, to the dental examiner. The dental examiner will take all papers and send them to the Surgeon-general's office in single inclosures.

2. These examining boards are authorized to conduct the necessary examinations without reference to the Surgeon-general's office. The examiner will arrange to examine the applicant on a mutually agreeable date, and furnish all blanks that may be necessary.

3. When you report to the examiner you should present your diploma, state license, testimonials from two reputable persons as to your citizenship, character, and habits, together with this letter, and your application for appointment, certified to before a notary public.

4. Officers commissioned in the Dental Reserve Corps will be subject to call for any duty which the exigencies of the service may require.

Appointment in the Dental Reserve Corps.

1. If an applicant has already sent in his application direct to the Surgeon-general of the U. S. Army, he will be invited by that office to appear for examination for appointment in the Dental Reserve Corps before one of the regular or preliminary examining boards. The board designated by the department to conduct the examination for the applicant will do so on a mutually agreeable date.

2. Your personal history and other papers have been forwarded to the board direct. When you report for examination you should present (*a*) your dental diploma, (*b*) state license, (*c*) evidence of citizenship (if of foreign birth), (*d*) this letter of invitation, and —if they were not forwarded to this office with your personal history—(*e*) two testimonials from reputable persons as to your citizenship, character, and habits.

Fifty-five Years Present Age Limit.

1. When an applicant for appointment in the Dental Reserve Corps has passed the age limit (fifty-five years) for commission, the

War Department will be unable, for the present, to avail itself of such services. However, such papers will be placed on file for future reference, in case any change is made in the age limit now established.

Recommended to the Adjutant-General for Commission.

1. The Surgeon-general will inform an applicant, if he passes the examination for appointment in the Dental Reserve Corps of the Army, that he has been found qualified for such an appointment. He will then be recommended to the Adjutant-general of the Army for commission as first lieutenant in that corps.

2. When an applicant receives his commission he will be requested, and the dental committee would urge him, to wire his acceptance and forward oath by return mail.

Degree of Doctor of Dental Surgery Necessary for Commission.

1. Only applicants who have the degree of Doctor of Dental Surgery are eligible for commission in the Dental Reserve Corps.

Dentists in the National Guard Ineligible for Commission.

1. An applicant for appointment who is a member of the National Guard is ineligible for commission in the Dental Reseve Corps.

An Applicant of Foreign Birth—Condition as to Eligibility.

1. The law under which appointments in the Dental Reserve Corps are made requires that persons of foreign birth, to be eligible for commission, must have completed their naturalization papers as citizens of the United States.

No Waivers of Physical Disqualifications.

1. An applicant who has been examined for the Dental Reserve Corps and found physically disqualified will not be commissioned, as no waivers of physical disqualification can be made at this time. This may possibly be changed as the war develops, but for the present the War Department regrets that it will be unable to avail itself of your services.

Women Dentists Not Eligible.

1. The War Department is notifying all women applicants for appointment in the Dental Reserve Corps that women dentists are not eligible for appointment. However, this may possibly be changed as the war develops.

Colored Applicants for the Dental Reserve Corps.

1. Dentists of the colored race are eligible for appointment in the Dental Reserve Corps on the same basis as white men. When commissioned, they will be kept on the inactive list until colored troops are organized, or until a special training camp is established to which they may be sent.

2. The fact that the applicant is colored should in every case be noted on the professional examination record.

[A list of the medical reserve officers who make the physical examinations and of the dental examiners is published in the July issue of the *Journal of the National Dental Association.* —Ed.]

Dental Officers Reserve Corps.

The following dentists have received commissions as first lieutenants in the Dental Officers Reserve Corps of the U. S. Army up to date of going to press:

Albin, John David, Overland, Mo.
Ackley, John Felix, St. Louis, Mo.
Ackley, James Murray, St. Louis, Mo.
Alley, E. C., Washington, D. C.
Angelo, Guy Wilson, Washington, D. C.
Applegate, Albert Milne, New York City.
Ashton, John Thornton, Alexandria, Va.
Bailey, Frank James, Hartford, Conn.
Barbot, Victor D., Augusta, Ga.
Barker, Frank P. K., Gladwyne, Pa.
Barkely, Earl Conwell, Detroit, Mich.
Barr, Edward Wallace, Bowling Green, Ky.
Beard, Chas. Van Buren, Tullahoma, Tenn.
Beaty, Fred Allison, Union City, Ind.
Beers, Lloyd Yohe, Washington, D. C.
Bird, Stephen Trinkle, Princeton, W. Va.
Bouden, Harry Ellwood, Philadelphia, Pa.
Boyd, Ernest Edgar, St. John, Kan.
Braninger, Earl Clifton, Maryville, Mo.
Brann, Clinton Tilman, Knoxville, Iowa.
Bratton, Roscoe Conkling, Galion, Ohio.
Brown, James A., St. Louis, Mo.
Brown, Joseph Leslie, Kansas City, Mo.
Brun, B. Lucien, Baltimore, Md.
Buckley, Delmer M., Kansas City, Mo.
Bull, Harry L., Jersey City, N. J.
Cassell, George L., Jr., Johnstown, Pa.
Church, Carrol L., Base Hospital No. 1.
Clark, Stanley W., Chicago, Ill.
Clayton, Wiltshire Clark, Brooklyn, N. Y.

Coleman, Geo. Antonius, Philadelphia, Pa.
Collins, Joseph Patrick, Denver, Colo.
Conly, Thomas Walter, San Francisco, Cal.
Conner, James Thomas, Chattanooga, Tenn.
Crawford, William P., Clifton Heights, Pa.
Crist, Chalmers Lee, Plainfield, N. J.
Croll, Faber W., Philadelphia, Pa.
Davies, Evans William, Cleveland, Ohio.
Denholm, Charles Jefferson, Pittsburgh, Pa.
De Verges, Paul, Base Hospital No. 24.
Dingler, Howard Ralph, Detroit, Mich.
Dickson, Ross Oscar, Blackwell, Okla.
Dixon, Arthur Pue, Cumberland, Md.
Donnell, Clifton Edwin, Indianapolis, Ind.
Eggleston, Wm. James, Germantown, Phila.
Eller, Robert Lloyd, Washington, D. C.
Ennis, LeRoy M., Philadelphia, Pa.
Estes, Weston Burgess, New York City.
Evans, Frederick Earl, Fort Jones, Cal.
Fansler, Orville Newton, Washington, D. C.
Feyler, Howard C., Fort Benj. Harrison, Ind.
Freeman, Charles West, Chicago, Ill.
Gaskill, J. Howard, Base Hospital No. 38.
Godfrey, Cranston Fr'klin, Hingham, Mass.
Grannick, Theodore Dayton, Denver, Colo.
Gray, Chas. John, Petoskey, Mich.
Grove, Orville A., Palestine, Tex.
Gullifer, William Harry, Belmont, Mass.
Harvitt, Henry, Memb. Gen. Hosp. No. 3.
Heiman, Leonard Jackson, New York City.
Hendrickson, Frank E., Rochester, N. Y.
Henshaw, Winifred E., Peru, Ill.
Herke, Oliver Louis, Cleveland, O.
Hogan, John Reid, Washington, D. C.
Homer, Harry L., Memb. B. Hosp. No. 36.
Hunt, Wilson G., Asbury Park, N. J.
Irving, William Watson, New York City.
Jack, Charles Shoemaker, Philadelphia, Pa.
Jagendorf, M. A., Memb. Gen. Hosp. No. 1.
Johnson, James Andrew, Norris City, Ill.
Jones, Earl Pearson, Mansfield, O.
Joseph, T. Cedwyn, Scranton, Pa.
Kail, Ira Jacob, Huntington, W. Va.
Kearby, Allen Neel, Wills Point, Tex.
Kelly, Edmund John, El Paso, Tex.
Kemper, Homer Thomas, St. Louis, Mo.
Kenney, Arthur F., R. C. B. Hosp. No. 13.
Keyser, Herman J., Philadelphia, Pa.
Landy, Louis Arthur, Cleveland, O.
Lankford, Livius, Jr., Baltimore, Md.
Leff, Jacob Harold, New York City.
Leser, Abr. Harrison, San Fancisco, Cal.
Lewis, Clifford Elbert, Shelton, Conn.
McCausland, John McG., Washington, D. C.
McCreary, Walter H., Youngstown, O.
McCue, Alonzo G., Jr., Bluefield, W. Va.
McGrath, Gerald B., Fort Adams, R. I.
McGrath, Joseph Michael, Malden, Mass.
McMillan, Hugh, Base Hospital No. 25.
McMurtry, L. Hilliard, San Francisco, Cal.
MacDonald, Chas. Franklin, Jr., N. Y. City.
MacGibbon, Everett E., B. Hosp. No. 26.
MacLachlan, Alan, Cleveland, O.
Magruder, Augustin L., New Orleans, La.
Meares, Chester M., Lake View, S. C.
Mensching, Fred. Francis, New York City.
Merrill, John Rogers, Jr., New York City.
Miller, Archibald L., Takoma Park, D. C.
Miller, Henley Earl, Woodland, Cal.
Morgan, Robert W., Youngstown, O.
Morris, Edwin Virgil, San Francisco, Cal.
Murdock, Reginald Scott, St. Louis, Mo.
Murphy, Courtney Jeremiah, St. Louis, Mo.
Nance, William Lambert, Fort Valley, Ga.
Neal, Max, Pittsburgh, Pa.
Nelson, James Joseph, Jr., Folcroft, Pa.
Nesbit, Bruce Squires, Northumberland, Pa.
Netherland, Frank B., Washington, D. C.
Nolan, Harry M., New Orleans, La.
O'Flinn, John Edward, Meridian, Miss.
O'Neil, Gerald B., Chicopee Falls, Mass.
O'Reilly, James Henry, New Orleans, La.
Owens, John Sadler, Haddonfield, N. J.
Parker, H. Lindsay, Winchester, Mass.
Peters, John Louis, New York City.
Pickering, Charles F., Clarksville, Tenn.
Potter, William H., Boston, Mass.
Potts, Herbert A., R. C. Base Hosp. No. 13.
Proctor, David Archibald, Oakland, Cal.
Raymond, Edward H., New York City.
Reid, H. A., B. Hosp. No. 25.
Richardson, Walter H., Worcester, Mass.
Roberts, Austin Freeman, Pasadena, Cal.
Rogers, Francis Joseph, Washington, D. C.
Ross, Gordon Laggett, Kansas City, Mo.
Rothwell, Bertram Sedden, Cleveland, O.
Rynearson, Bert, B. Hosp. No. 25.
Sams, Homer Lash, San Francisco, Cal.
Sandiford, Chester Leigh, Boston, Mass.
Sandoz, George Ellis, New Orleans, La.
Schell, Robert, B. Hosp. No. 25.
Schoppe, Vincent Ferdinand, St. Louis, Mo.
Sechrest, Wallace Curtis, Bicknell, Ind.
Shannon, William Tillman, Detroit, Mich.
Sherburne, William Haven, Woburn, Mass.
Shields, Sturges Bradford, New York City.
Shoemaker, Edwin, Philadelphia, Pa.
Sibley, George Julian, Washington, D. C.
Smith, David Scull, Philadelphia, Pa.
Smith, Harry Reynolds, Ironton, O.
Smith, James William, San Jose, Cal.
Spence, Wm. Archibald, Newton, Miss.
Stahl, Harfey Edwin, New York City.
Starke, George G., Bronx, N. Y.
Starr, Robert Walter, Jr., Philadelphia, Pa.
Stern, Leo, New York City.
Stewart, Jonah Hartsell, Winchester, Tenn.
Stone, J. Donald, Philadelphia, Pa.
Stoodly, Gerald Frederick, Berkeley, Cal.
Summerfield, J. Henry, Denton, Md.

Sykes, Wm. S., London, England.
Thompson, Richard K., Washington, D. C.
Trappey, Oscar Joseph, Base Hosp. No. 24.
Trimpi, Norman Whitfield, E. Orange, N. J.
Vandervoort, John Coe, New York City.
Vandewater, Clarence M., Madison, N. J.
Wagoner, John B., San Antonio, Tex.
Ward, Forest W., Youngstown, O.
Watson, John B., Yonkers, N. Y.
Welcher, Marvin V., B. Hosp. No. 19.
Wheeler, Herbert L., New York City.
Wickins, Ralph H., B. Hosp. No. 19.
Wilen, Charles Henry, Bronx, New York.
Wise, Charles W., Huntington, W. Va.
Wisecup, Clarence E., St. Louis, Mo.
Wright, Wm. Thos., Jr., Baltimore, Md.
Wyatt, Ford Walton, Indianapolis, Ind.
Younglove, John Ardin, Berlin, Wis.

Army Dental Corps.

Following is a list of candidates who qualified in the examinations held at various posts for appointment as first lieutenant in the Army Dental Corps:

At Letterman General Hospital—Oliver I. Edwards, Westwood, Cal.; Earle J. McClung, Montesano, Wash.; Oliver J. Christiansen, Alameda, Cal.

At Camp at Empire, Canal Zone—Neal A. Harper, Corozal, C. Z.

At Fort Sam Houston, Tex.—James B. Manning, San Antonio, Tex.; Earle L. Hering, San Antonio, Tex.

At Jefferson Barracks, Mo.—Mark H. Welch, Macon, Miss.; Robert L. Lowry, Jr., St. Louis, Mo.; Claude R. Hollister, Manteno, Ill.; Roy M. Kisner, Ballair, Ill.; William C. Webb, Jr., Higginsville, Mo.; Samuel J. Rohde, St. Louis, Mo.; Nathan C. Pickles, 1st Missouri Ambulance Co., Laredo, Tex.

At Fort Bliss, Tex.—Wm. D. White, El Paso, Tex.

At Fort Slocum, N. Y.—Orville A. Grove, Washington, D. C.; Frederick C. Daniels, Waterbury, Conn.; Harry A. Donahue, Essex Junction, Vt.; Albert S. Cumming, New York City; Timothy F. Leary, Springfield, Mass.; Edward C. Alley, Washington, D. C.

At Columbus Barracks, Ohio—Chester Denham, Louisville, Ky.; Lynn H. Tingay, Battle Creek, Mich.; Harold E. Albaugh, Marion, O.; Timothy Harden, Walterboro, S. C.; Harry E. Smalley, East Chicago, Ind.; Hugh M. Tarpley, Cheraw, S. C.; Leroy P. Hartley, Greenville, S. C.; Lawrence K. Anderson, Fort Wayne, Ind.; Arthur J. Hart, Army Medical School, Washington, D. C.; Jacob L. Brause, Washington, D. C.; Clinton R. Boone, Atlanta, Ga.; Edward A. Thorne, Elizabethtown, Ky.

Navy Dental Corps.

The following to be dental surgeons for a probationary period from July 3, 1917:

Akerstrom, Sidney M., Roxbury, Mass
Benepe, Louis M., Litchfield, Minn.
Bockey, Charles C., Washington, D. C.
Brown, L. Hoyt, Portland, Ore.
Chamberlain, D. L., Colorado Springs, Colo.
Epes, Travis L., Roanoke, Va.
Fowler, George C., Washington, D. C.
Frost, Leon C., Washington, D. C.
Henry, Russell A., Millersburg, Pa.
Herlihy, John E., Fitchburg, Mass.
Lough, James C., San Francisco, Cal.
Morrow, Clark E., St. Louis, Mo.
Nicholas, Guy E., Rockland, Me.
Norkiewicz, Anthony A., Washington, D. C.
Phillips, Glen S., Linesville, Pa.
Siegel, Jerold M., Three Rivers, Mich.
Snyder, L. F., Doland, S. D.
Taylor, William R., Wadena, Minn.
Van Patton, Robert, Philadelphia, Pa.
Weir, Francis S., Walla Walla, Wash.
Willett, Errol W., Portland, Ore.

The following is a list of the candidates who qualified in the recent examination for appointment to the Navy Dental Corps:

Daniels, H. A., Paris Island, S. C.
Davis, R. S., Meriden, Conn.
Delmore, H. F., Wausau, Wis.
Jarboe, E. D., Portersville, Md.
Kaufman, Frank, Gouverneur Hospital, New York City.
Lippman, L. B., Bronx, N. Y.
Maxwell, R. S., Denver, Colo.
McGann, P. S., Somerville, Mass.
Root, J. T., Washington, D. C.
Swenson, M. G., Minneapolis, Minn.
Tartie, J. A., Portsmouth, N. H.
Tinsley, C. G., Macon, Ga.
Ward, A. B., Milwaukee, Wis.
Weaver, K. K., New Lebanon, O.
Yeisley, P. W., Uniontown, Pa.

Assignments.

Army Dental Reserve Corps.

Week ending July 7th.

1st Lieut. Charles F. Pickering is ordered to active duty at Gettysburg, Pa.

The following-named officers are ordered to active duty and will proceed to Fort Riley for duty: 1st Lieuts. Fred A. Beaty and Wallace C. Sechrest.

The following-named officers are ordered to active duty and will proceed to Fort Oglethorpe for duty: 1st Lieuts. John M. McCausland and William L. Nance.

1st Lieut. Louis A. Landy is assigned to active duty at Madison Barracks, N. Y.

1st Lieut. Clifton E. Donnell is ordered to active duty at Fort Benjamin Harrison.

1st Lieut. Frederick F. Mensching is assigned to active duty at Syracuse, N. Y.

1st Lieut. James J. Nelson, Jr., is assigned to active duty at Gettysburg, Pa.

1st Lieut. Harvey E. Stahl is ordered to active duty and will proceed to Philadelphia, Pa., and report to Lieut. Col. Herbert Deakyne, corps of engineers, for duty.

Week ending July 14th.

1st Lieut. Frank E. Hendrickson is assigned to active duty and will proceed to Boston, Mass., and report for assignment to duty.

Week ending July 21st.

1st. Lieut. Frank E. Hendrickson will proceed to Fort Constitution for duty.

1st Lieut. Weston B. Estes is assigned to active duty and will proceed to Fort Totten for duty.

1st Lieut. Charles F. MacDonald, Jr., is assigned to active duty at Washington, D. C.

1st Lieut. Herman J. Keyser is assigned to active duty at Gettysburg, Pa.

The following-named officers are assigned to active duty and will report by telegraph to the commanding general of the Southern Department for assignment to duty: First Lieutenants Joseph L. Brown, James A. Johnson, Chester M. Meares, Harry M. Nolan, John E. O'Flinn, James H. O'Reilly, George E. Sandoz, Vincent F. Schoppe, William A. Spence, and Clarence E. Wisecup.

1st Lieut. Stephen T. Bird is assigned to active duty at Washington, D. C., with 6th engineers.

1st Lieut. Charles F. MacDonald, Jr., will proceed to New York, N. Y., and report to Lt. Col. Charles H. McKinstry, corps of engineers, for assignment to duty.

1st Lieut. Roscoe C. Bratten is assigned to active duty at Washington, D. C., and report to Maj. Theodore C. Lyster, medical corps, for duty.

Week ending July 28th.

The following-named officers are ordered to active duty and will proceed to Fort Riley for duty: 1st Lieuts. Ross O. Dickson, Theodore D. Grannick and Ford W. Wyatt.

1st Lieut. Howard I. Benedict is relieved from station at Fort Barrancas and assigned to station at Fort Screven.

1st Lieut. Arthur P. Dixon is assigned to active duty at Fort Myer.

1st Lieut. John T. Ashton is assigned to active duty at Fort Oglethorpe.

The following-named officers are assigned to active duty and will proceed to San Francisco, Cal., and report to commanding general, Western Department, for assignment to duty: 1st Lieuts. John F. Ackley, Jas. M. Ackley, Joseph P. Collins, Howard R. Dingler, Charles J. Gray, Courtney J. Murphy.

The following-named officers are ordered to active duty and will proceed to Fort McPherson for duty: 1st Lieuts. Charles V. B. Beard, James T. Conner, Jonas H. Stewart.

1st Lieut. Chester L. Sandiford is ordered to active duty and will proceed to Fort Ethan Allen for duty.

1st Lieut. George G. Starke is ordered to active duty and will proceed to Fort Oglethorpe, Ga., for duty.

The following-named officers are ordered to active duty and will proceed to Canal Zone for duty: 1st Lieuts. Jacob H. Leff and Leonard J. Heiman.

1st Lieut. James A. Campbell is assigned to active duty at San Diego, Cal., Aviation School.

Week ending August 4th.

1st Lieut. William T. Wright, Jr., will proceed to Fort Myer and report to 12th field artillery for duty.

1st Lieuts. Albert M. Applegate and William W. Irving will report for duty with base hospital No. 8.

The following-named officers will proceed to Angel Island Recruiting Station, Cal. for duty: 1st Lieuts. Thomas W. Conly, Frederick E. Evans, Austin F. Roberts, and James W. Smith.

The following-named officers will report to commanding general, Western Department, for duty: 1st Lieuts. Louis H. McMurtry, Henley E. Miller, Homer L. Sams, and Gerald F. Stoodly.

The following-named officers will proceed to Fort Adams for duty: 1st Lieuts. Cranston F. Godfrey, Joseph M. McGrath, Gerald B. O'Neil, and J. Henry Summerfield.

The following-named officers will procced to Fort Sam Houston for duty: 1st Lieuts. Carl A. Anderson, Otto F. Apel, Oliver L. Herke, Earl J. Hill, Jay M. Hisey, and Earle N. Hoopman.

1st Lieut. T. Cedwyn Joseph is assigned to active duty and will proceed to Philadelphia, Pa., and report to Lt. Col. Herbert Deakyne, C. E., for duty.

1st Lieut. Edwin V. Morris will proceed to Alcatraz, Cal., disciplinary barracks for duty.

1st Lieut. Homer T. Kemper will proceed to Fort Oglethorpe for duty.

Week ending August 11th.

1st Lieut. Robert L. Eller will report to 10th engineers, American University, Washington, D. C., for duty.

1st Lieut. John Reid Hogan will proceed to Plattsburg Barracks, N. Y., for duty.

1st Lieut. Harry E. Bouden will proceed to Fort Des Moines training camp for duty.

1st Lieut. E. C. Alley is assigned to active duty at Gettysburg, Pa.

1st Lieut. David A. Proctor will proceed to Vancouver Barracks, Wash., for duty.

1st Lieut. Gerald F. Stoodly will report at School of Military Aeronautics, Berkeley, Cal., for duty.

1st Lieut. Homer L. Sams will proceed to Presidio of San Francisco for duty.

Dental Corps.

Week ending August 4th.

Leave for two months on surgeon's certificate is granted 1st Lieut. J. Craig King.

Week ending August 11th.

1st Lieut. Arthur J. Hart, now at Army Medical School, will report at that school for duty.

Forsyth Dental Infirmary for Children.

NEW DEPARTMENT—LIBRARY AND MUSEUM.

THE trustees and director of the Forsyth Dental Infirmary for Children have authorized the creation of a new department, to be known as the "Library and Museum." They solicit from the dental profession contributions of books and dental periodicals, particularly those out of print and not readily obtainable by purchase; also specimens of dental abnormalities, casts, or specimens of unusual structures of dental interest, for all of which permanent acknowledgment will be given.

FREDERICK A. KEYES, D.M.D.,
Librarian and Curator of Museum.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING JULY 1917.

July 3.

No. 1,232,203, to Isaac Brown. Artificial tooth.

No. 1,232,280, to Herbert N. Gorham. Mandrel.

No. 1,232,290, to Josef Grünberg. Symmetroscope.

July 10.

No. 1,232,517, to Charles H. Ely. Toothbrush.

No. 1,232,636, to Elmer E. Wightman. Machine for forming metallic tooth backings.

No. 1,232,698, to Max Lifshitz. Dental bridge.

No. 1,232,933, to Kenkicki Kimura. Toothbrush.

No. 1,233,131, to Charles R. Schwartz. Measuring tool.

No. 1,233,152, to Henry W. Wenzel. Artificial tooth.

No. 1,233,182, to John E. Burns. Casting machine.

No. 51,016, Design, to Thaddeus W. Kelton. Dental cabinet.

July 17.

No. 1,233,687, to William M. Muchow. Floss-silk holder.

No. 1,233,770, to Willard M. Farrow. Pliers.

No. 1,233,817, to Elmer E. Smith. Wrist joint for handpieces.

No. 1,233,826, to Henry E. Weber. Cuspidor.

No. 1,233,857, to Norman S. Essig. Denture attachment.

No. 1,233,859, to Charles W. Fertig and Adam J. May. Dental chair.

July 24.

No. 1,234,139, to Arthur N. Cross. Artificial tooth.

July 31.

No. 1,234,958, to Samuel G. Supplee. Impression device.

No. 1,235,004, to Charles B. Bratt. Artificial tooth.

THE
DENTAL COSMOS

VOL. LIX. OCTOBER 1917. No. 10.

ORIGINAL COMMUNICATIONS

A Study of the Micro-organisms of Dental Caries.*

By PERCY R. HOWE, A.B., D.D.S., Boston, Mass.,
Assisted by RUTH E. HATCH.

From the Research Laboratory of the Forsyth Dental Infirmary for Children.

(Read before the Pennsylvania State Dental Society, at its annual meeting, Philadelphia, June 26, 1917.)

THE literature upon the mycology of the mouth is voluminous, yet it contains no work upon dental caries that meets modern bacteriological requirements.

Miller[1] (1880–1890) has carried out the most extensive work done upon the subject of dental caries. He placed teeth in a fermenting mixture of bread and saliva. This he renewed from time to time. He succeeded after three months in producing artificial decay which "could not be told either microscopically or macroscopically from true caries." He demonstrated by zinc crystallization that such a fermenting mixture produced lactic acid. Upon this evidence he originated the lactic acid theory of caries. He strengthened his theory by presenting histological sections of decaying teeth. The bacteria that have the property of fermenting sugar are numerous. Miller had no thought of bacterial specificity in this action. He described a few oral bacteria, such as Leptothrix innominata, B. buccalis maximus, Iodococcus vaginatus, Spirillum sputigenum, Spirochæte dentium, but he declared that his "bacteriological study upon caries had not been sufficiently extensive or conclusive" to warrant being incorporated in his book. His work was done thirty years ago.

Karolyi, Arkovy,[2] Dobrzyniecki,[3] Siberth, Vignal,[4] Rodella,[5] Goadby,[6] Choquet,[7] and others[8–12] have either advanced theories based upon bacterial activities or else have carried out bacteriological studies upon the subject of dental caries.

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* This article was also published in the *Journal of Medical Research* for July 1917.

Among these writers Goadby[6] (1902–1903) has done by far the most important work. He has studied the micro-organisms of the superficial and the deep layers of decay, and classifies these bacteria as acid-formers and liquefiers. He finds that the deeper layers of caries contain a smaller variety of bacteria than do the superficial layers. In the deep layers of caries in twenty cases he finds constantly Streptococcus brevis, B. necrodentalis, and nothing else. In other work he adds to these Staphylococcus aureus. In the superficial decay he finds B. mesentericus, B. furvus, B. plexiformis, both Staphylococcus aureus and albus, Sarcinæ, and some other forms. He lays particular emphasis on the streptococcus and staphylococcus in connection with caries. Dobrzyniecki[3] (1902–1903) agrees with Goadby in his findings and in his opinions.

Choquet[7] (1900) isolated five organisms from decay beneath fillings. These were not familiar to other workers of his time.

Other students give conclusions concerning the process of caries based solely upon smear examinations; still others upon cultural studies in which the source of the specimens studied has been the saliva or a mixture of the saliva, tongue scrapings, and tooth scrapings—material remote from the actual carious process.

Kligler[13] (1915) in his work upon oral micro-organisms has made bacterial counts of the material collected from between the teeth, on tooth surfaces, and from carious teeth. He also has described many types of oral micro-organisms. In caries he believes that the oral flora changes its character from a streptococcal to an acid-producing rod and a thread flora. He believes that in caries there is a large numerical increase in the oral micro-organisms, but that the types actually concerned in the carious process are relatively few.

He describes B. mesentericus, B. putrificus, B. acidophilus (Moro), a non-pleomorphic beaded bacillus, a leptothrix which he believes he has cultivated, and Cladothrix placoides. He also says that Goadby's necrodentalis conforms in most particulars to the acid-producing bacteria of Moro, Finkelstein, Rodella, Mereschkowsky, Kendall, and others.

It is evident from this review of the work upon caries that there is no agreement in the bacteriological findings of the various workers.

We have endeavored to study the bacteriology of dental caries more thoroughly and more in detail than has been done heretofore. The eighteen hundred children weekly treated for defective teeth at this institution afford at once an example of the need of such a study and an exceptional opportunity for it.

In order to arrive at something definitely conclusive in this work we have studied closely a larger number of cases than have previously been used. In order to be sure that we had under investigation the proper flora we have taken our material for culture from cases where caries is actively progressant. Caries is distinctly a disease of childhood, therefore we have confined our work to children.

For the same reason the sixth and twelfth year molars were selected. These are the teeth most subject to decay; they also furnish more material for study.

Inasmuch as pulp involvement complicates matters by introducing a different type of flora, care was used to avoid including such cases in our statistics. That uniform conditions might be assured, the children selected were of approximately the same age—that is, from ten to fourteen years.

The decay was studied under three different conditions:

Class I. Because the open carious tooth cavity is exposed to every kind of bacterial contamination, and because this adds confusion to the investigation, an attempt was made to eliminate the incidental invaders. A unique procedure was adopted for this purpose. Fillings were inserted over the bacterial carious mass, care being exercised not to injure this flora in any way. It seemed probable that the extraneous flora would die off, while the flora that had the best hold upon life in this environment would survive. After a period of from six week to three months the fillings were removed and the underlying carious dentin cultured.

Class II. The second condition under which the decay was studied was for the same purpose as the first. Fillings having slight antiseptic properties were placed over the carious tooth substance, but left for a much shorter period. Here we believed that the bacteria that would most readily yield to the effect of the antiseptic would also give way to the more sturdy and vigorous flora intimately associated with caries.

Class III. The third manner of studying the carious tooth material consisted of a bacterial examination of the open carious tooth.

In all three procedures the teeth were isolated by the rubber dam, painted with iodin, and the material for study removed with sterile instruments and cultured.

The decay material was removed in three layers: a superficial, a middle, and a deep layer, and later, from the deep dentin that appeared unaffected. Cultures were made from each stratum upon agar, glucose-agar, bouillon, and blood serum. These were grown aerobically and anaerobically.

It was seen that we were dealing with comparatively few organisms, and it was attempted to obtain these in pure cultures. Their morphological characteristics were studied extensively and they were subjected to biochemical and fermentation tests. It was evident from our studies that the constant and predominating flora of dental caries was the closely allied group of micro-organisms described by Moro, Tissier, and others. These were found in all the cases of decayed teeth examined and were the prevailing bacteria. In cases that had been under fillings for three months and under fillings with slight antiseptic properties for a shorter time no other micro-organisms were found. In the open carious teeth, yeast, Micrococcus catarrhalis, Staphylococcus, Streptococcus, and other bacteria were occasionally found, but there was no regularity in their appearance. Some member of or the entire Moro-Tissier group was always found, frequently nothing else. This group is tolerant of higher degrees of acidity than the bacteria above mentioned. It overgrows them in laboratory media. It forms very large amounts of acid. These properties account for the fact that the flora of the open carious tooth is not so varied as might be expected.

Under the first conditions of our study which we have designated as class I, twenty-seven cases were examined after inert fillings that had been inserted over carious dentin had been removed. These specimens were cultivated aerobically. Of these, 8 contained two members of the Moro-Tissier group, 3 contained three members, 6 contained one member. It was rare to find any other organisms present; 10 gave no growth. This does not signify that bacteria were absent from the decay, for the specimens were cultivated only aerobically, and as the growth in the tooth cavity had been under complete anaerobic conditions, without doubt the transition to full aerobiosis was too radical a step. Our other work supports this interpretation. We have never failed to find life in such cases when anaerobiosis was employed. It is admitted that this group grows best anaerobically. B. bifidus is held by some to be a strict anaerobe.

The essential point is that in these cases nothing was present except members of the Moro-Tissier group.

In class II, after the removal of fillings containing slight antiseptic properties, the cultured decay of the tooth gave similar results.

Class III was particularly interesting, for it showed that the flora of the open carious cavity is not varied; on the other hand, it is limited.

The acidific group is always present. In some cases nothing else is present and no other micro-organisms appear with any regularity. Of the eighteen cases studied, some member of the group was present in every one, and seven of the cases contained nothing else; 7 contained three members of the group, 5 contained two members, 4 contained one, and 2

Illustrations.*

(All are anaerobic cultures.)

FIG. 1. FIG. 2.

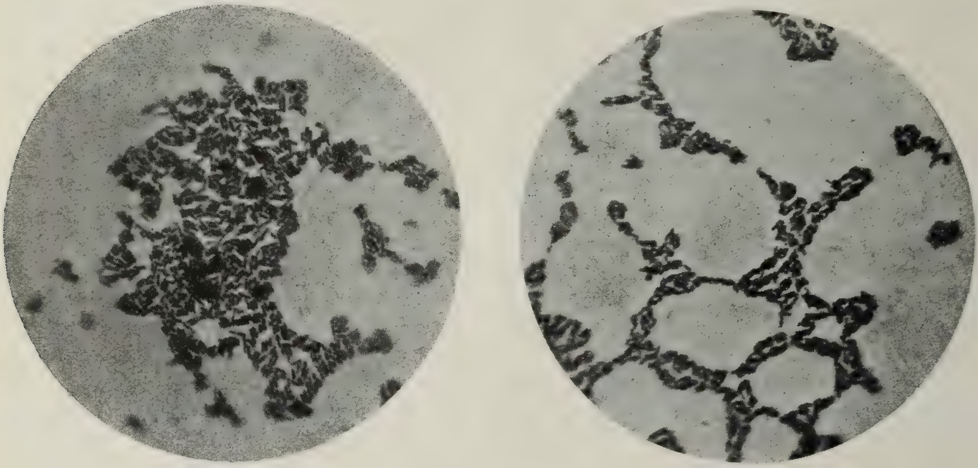
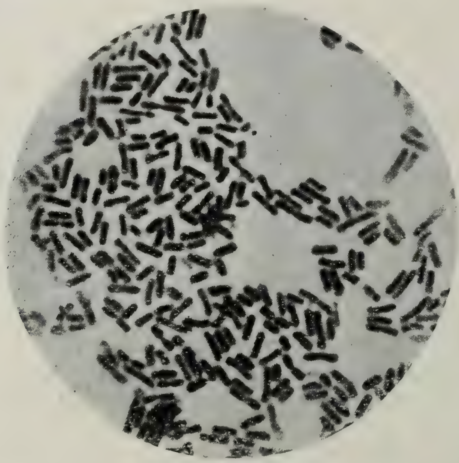


FIG. 3.



FIGS. 1–3. Bac. acidophilus: Fig. 1, Glucose-agar, 48 hrs., Gram st., × 840. Fig. 2, Agar, 48 hrs., Gram st., × 840. Fig. 3, Glucose-agar, Gram st., × 2000.

contained four. Yeast appeared in the superficial layer in seven cases, Micrococcus catarrhalis was found in four cases, Streptococcus in three, and Staphylococcus in three.

It is readily seen from these statistics that the only constant flora in dental caries is included in the Moro-Tissier group. It is equally evident that this is the predominant flora. Nothing else was

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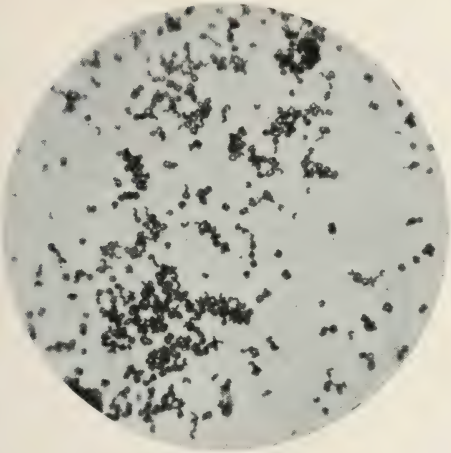
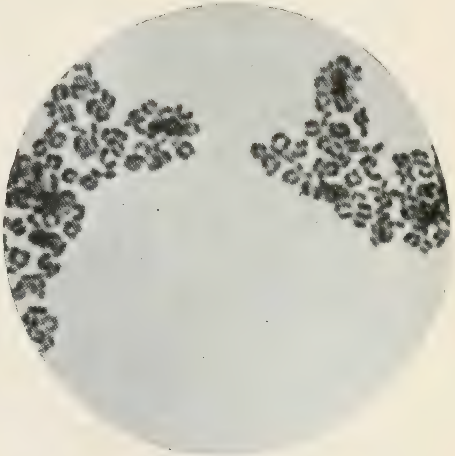
* The photomicrographs of the lower magnification were taken by Prof. Louis Derr of the Massachusetts Institute of Technology. The higher magnifications were taken at the Massachusetts General Hospital, and are the illustrations that accompany the publication of this work in the *Journal of Medical Research.*

FIG. 4.



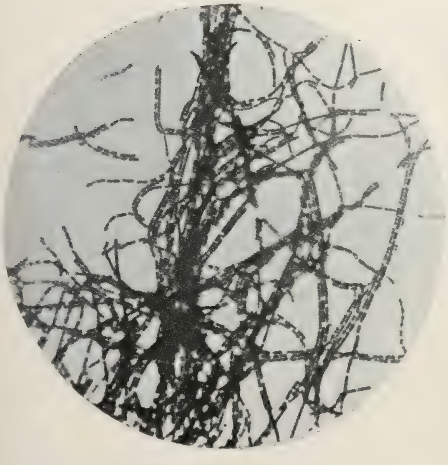
Bac. M: Glucose-agar, 48 hrs., Gram st., × 840.

FIG. 5.



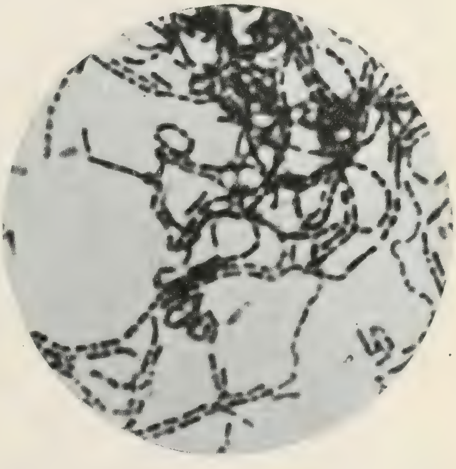
Bac. M: Glucose-agar, 48 hrs., Gram st., × 2000.

FIG. 6.



Bac. X: Glucose-agar, 48 hrs., Gram st., × 840.

FIG. 7.

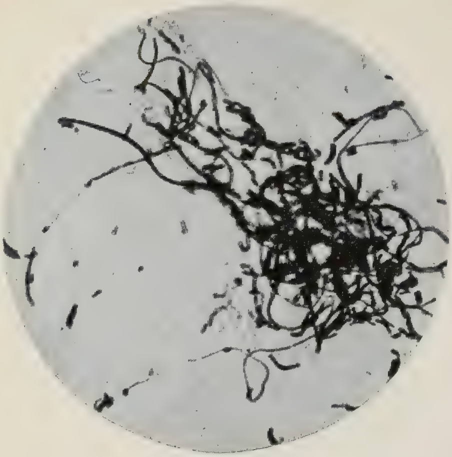


Bac. X: Glucose-agar, 48 hrs., Gram st., × 2000.

present in the cavities that had had the extraneous flora excluded by fillings. Nothing else was present in 38.8 per cent. of the open cavities. It is natural to expect this limitation in the types of the flora of dental caries when once its character is disclosed. For this group of micro-organisms is known, and its high acid-producing character is established. High acidity is not withstood by many organisms, so that the extraneous bacterial life does not here flourish. These micro-organisms by their high acid-forming properties possess, in a greater degree than do others, the capacity for at least inaugurating the carious dental process. They form, as we shall see farther on, more than 14 per cent. normal acid. They soften and produce results upon tooth sections that are similar to tooth decay in the mouth.

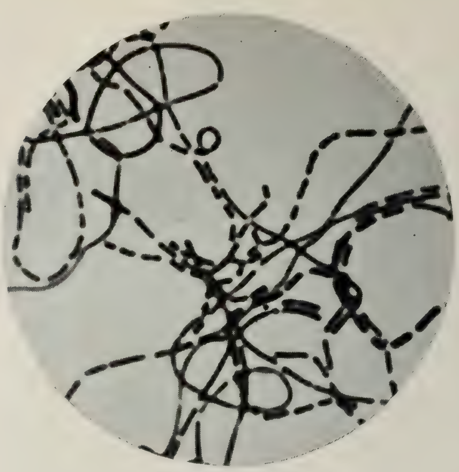
Before entering upon the description

Fig. 8.



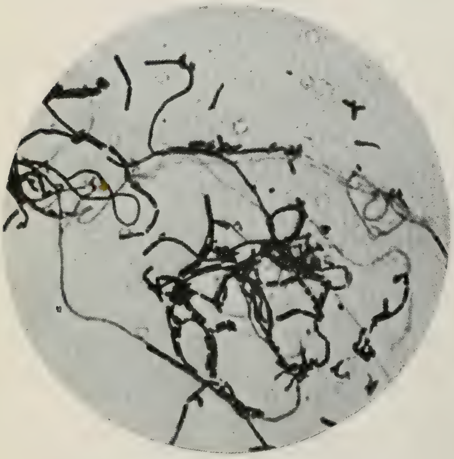
Bac. X: Glucose-agar, 48 hrs., Gram st., × 840.

Fig. 9.



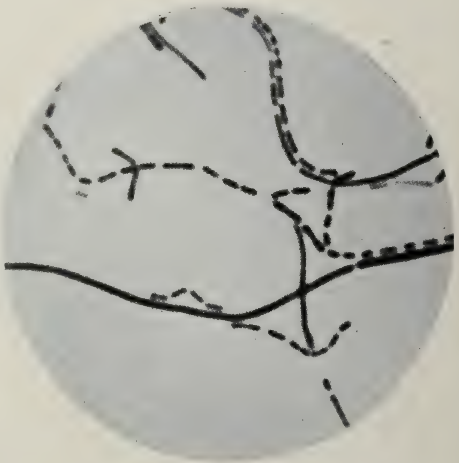
Bac. X: Glucose-agar, 48 hrs., Gram st., × 2000. (Note tangle of threads and chains.)

Fig. 10.



Bac. X: Glucose-agar, 48 hrs., Gram st., × 840.

Fig. 11.

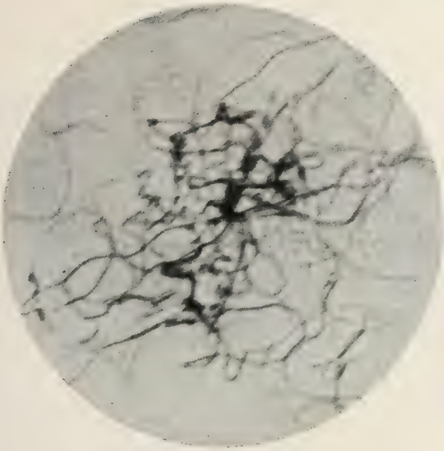


Bac. X: Agar, 48 hrs., Gram st., × 2000. (Note variation in length of bacilli, also heavy thread forms.)

and classification of these micro-organisms that we have found and studied in caries, some of the characteristics of this group may be mentioned. Moro,[14] Tissier,[15] Rodella,[5] Cahn, Passini, Herter,[16] Kendall,[17] Noguchi,[18] and others have done extensive work upon these bacteria, and have shown them to be the prevailing flora of the nursling's intestinal tract. The majority of observers have found the aciduric bacteria localized in the large intestine, and only under exceptional circumstances or conditions do they occur in the higher levels of the alimentary tract. Weiss believes that they would appear in the "more acid portion of the tract." Under normal conditions, then, these micro-organisms constitute the flora of the acid intestinal contents of the nursling. Their presence in dental caries has never been previously known.

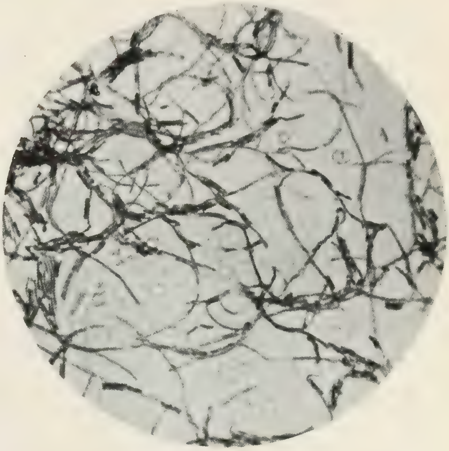
The presence of B. acidophilus in the

FIG. 12.



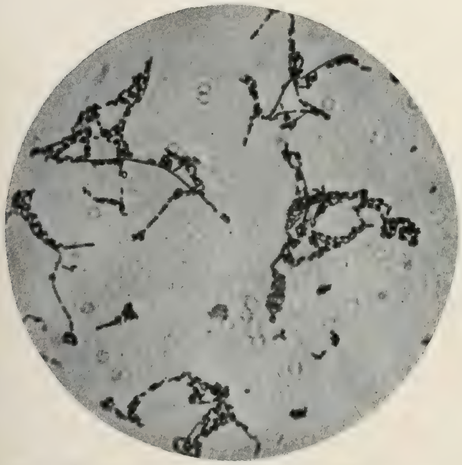
Bac. X: Blood serum, 48 hrs., Gram st., × 840.

FIG. 13.



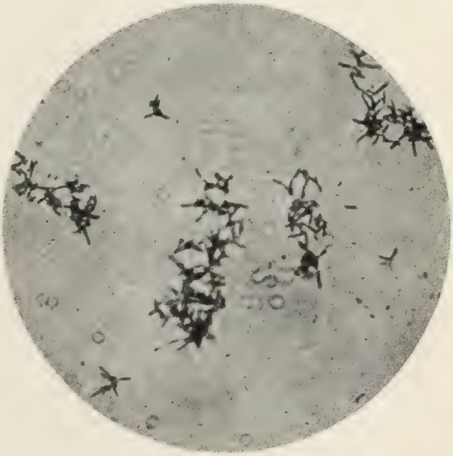
Bac. X: Glucose-agar, 72 hrs., Gram st., × 840.

FIG. 14.



Bac. X: Glucose-agar, 72 hrs., Gram st., × 840.

FIG. 15.



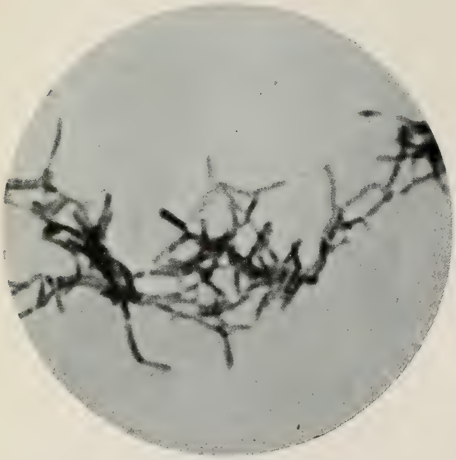
Bac. bifidus: Glucose-agar, 72 hrs., Gram st., × 840.

mouth has been noted, and Lewkowicz[19] mentions finding B. bifidus in the mouth of nurslings. But the presence of these micro-organisms in all dental caries, constituting the predominating flora, is a matter of interest in view of what has been said, and of the statement by Noguchi that, "In spite of numerous attempts, as yet no one has succeeded in tracing the source of B. bifidus outside of the intestinal tract." Why and how the group occurs in dental caries is not known.

It is natural to expect this Moro-Tissier group to have different characteristics in these two different parts of the alimentary canal, but in the respects of acid tolerance and high acid production they are very similar in both places.

Another thing that has been the subject of much study and discussion in con-

FIG. 16.

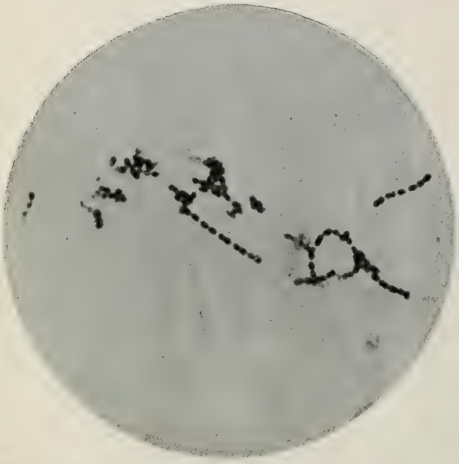


Bac. bifidus: Glucose-agar, 72 hrs., Gram st., × 2000.

FIG. 17.

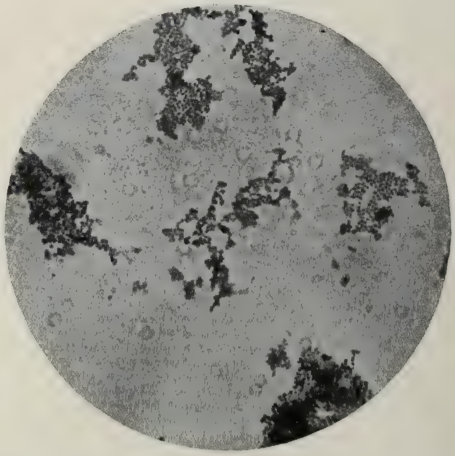
Bac. bifidus: Glucose-agar, 18 days, Gram st., × 840.

FIG. 18.



Bac. bifidus: Glucose-agar, 18 days, Gram st., × 1250. (Streptococcal form.)

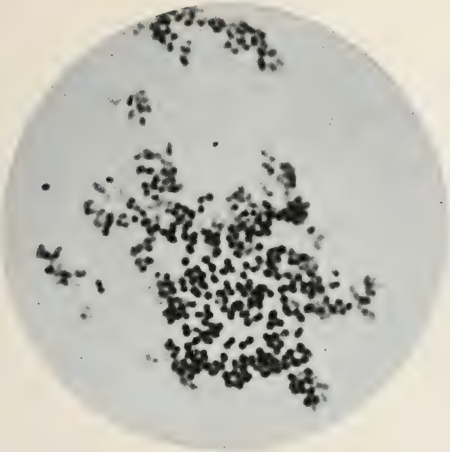
FIG. 19.



Bac. bifidus: Glucose-agar, 3 days, Gram st., × 840.

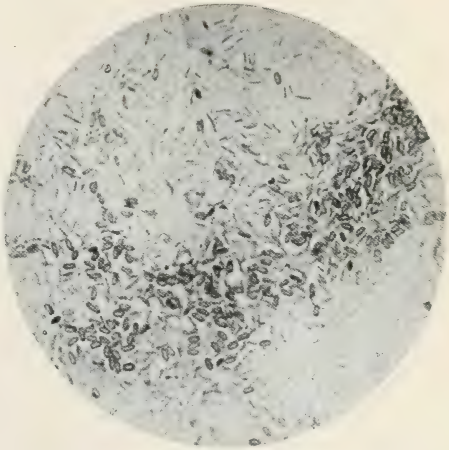
nection with this group of micro-organisms is their highly pleomorphic character. Moro continually mentions it. Noguchi has treated the subject in a most interesting manner in an article that gives an account of his study upon B. bifidus. He entitles his work, "The Pleomorphism of B. Bifidus Communis." He says: "The relation between B. bifidus communis and certain other Gram-positive organisms of the feces, such as B. acidophilus (Moro), Kopfchen-bacillus, B. tubercular-formis intestinalis (Jacobson), B. infantilis (Kendall), remains unsolved." At present it is difficult to say whether they are entirely different organisms, or whether they are different forms of one and the same organism. He was "able to show B. bifidus to be an anaerobic phase of an aerobic sporagenous organism belonging to the subtiloid group and closely re-

FIG. 20.



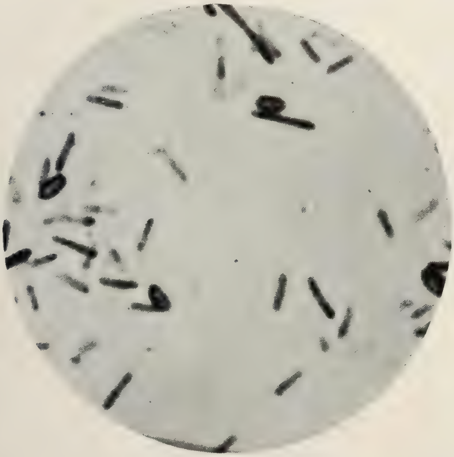
Bac. bifidus: Agar, 2 days, Gram st., × 1250. (Streptococcal form.)

FIG. 21.



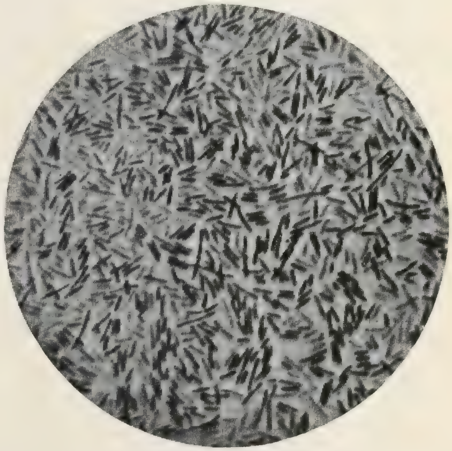
Bac. bifidus: Glucose-agar, 5 days, Gram st., × 840. (Rods and spores.)

FIG. 22.



Bac. bifidus: Agar, 7 days, Gram st., × 2000. (Rods and spores.)

FIG. 23.



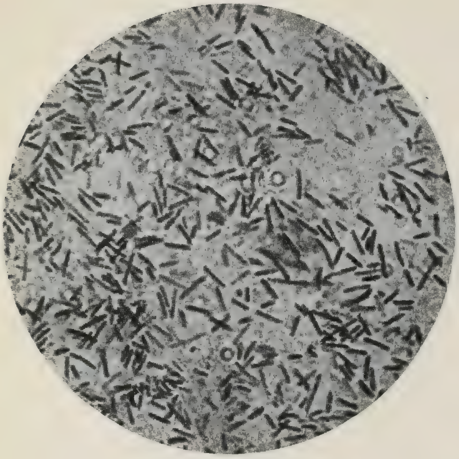
Bac. bifidus: Glucose-agar, 3 days, Gram st., × 840. (Rods and crosses.)

sembling, especially morphologically and biologically, B. mesentericus fuscus."

He shows B. bifidus in forms and groupings similar to acidophilus. He shows V-shaped, Y-shaped, fishtail, and bifurcating forms, streptococcal and staphylococcal forms, rods, and spores. He has been able to modify these and to change B. bifidus by varying degrees of anaerobiosis and aerobiosis from one extreme of form to the other.

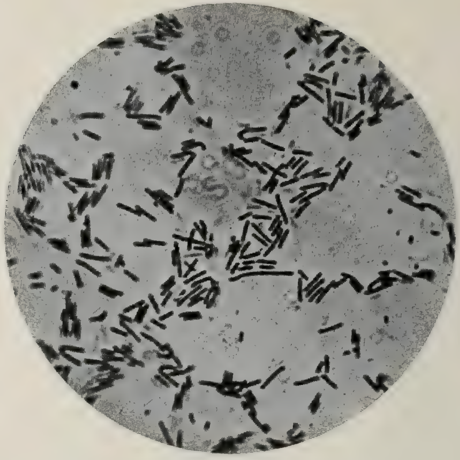
Noguchi emphasizes the importance of this in interpreting bacterial findings. We have been able to find all these forms in dental caries. We have been able to change them into different and characteristic forms by prolonged cultural work. We have succeeded in producing a sporulating stage from a bifurcating form and in modifying the spore-forming stage to the rod form by changing the aerobic to anaerobic conditions.

FIG. 24.



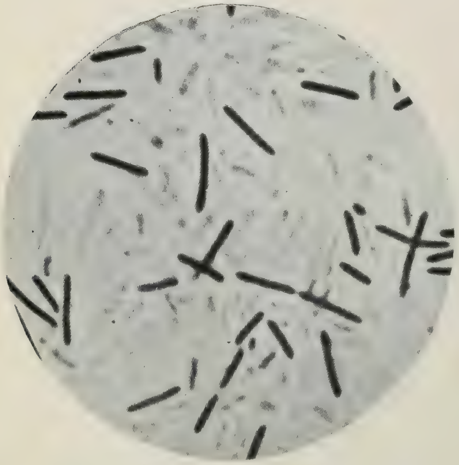
Bac. bifidus: Glucose-agar, 3 days, Gram st., × 840. (Rods and crosses.)

FIG. 25.



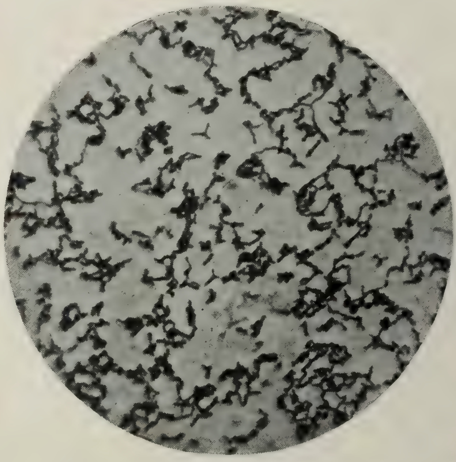
Bac. bifidus: Glucose-agar, 3 days, Gram st., × 840. (Rods and crosses.)

FIG. 26.



Bac. bifidus: Glucose-agar, 11 days, Gram st., × 2000.

FIG. 27.

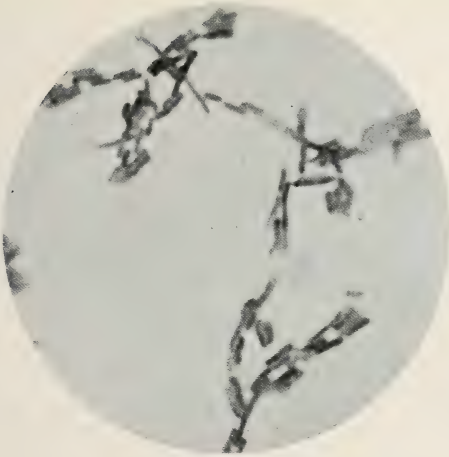


Bac. bifidus: Blood serum, 5 days, Gram st., × 840. (Club ends, bifurcating forms, fishtail forms.)

The question of pleomorphism has not been confined to B. bifidus. B. acidophilus has also been studied and is constantly termed "highly pleomorphic." Our studies seem to indicate that in the case of this micro-organism the pleomorphism has been exaggerated. The importance of taking this pleomorphism into consideration in the interpretation of bacteriological findings in the study of carious teeth is hard to overestimate. Indeed, the complete lack of attention it has received has obscured the whole of the bacteriological work heretofore done upon dental caries.

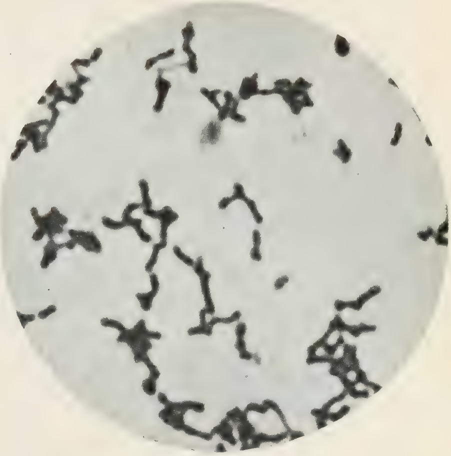
The organisms constantly found in dental caries, and belonging as we believe to the Moro-Tissier group because of their highly aciduric character, we call: Bacillus acidophilus (Moro), Bacillus X, Bacillus M, Bacillus Y, B. bifidus.

FIG. 28.



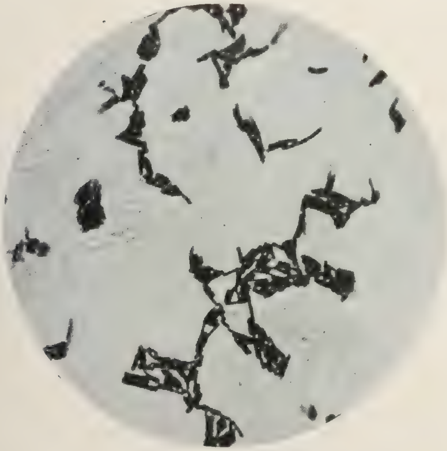
Bac. X: Blood serum, 2 days, Gram st., × 2000.

FIG. 29.



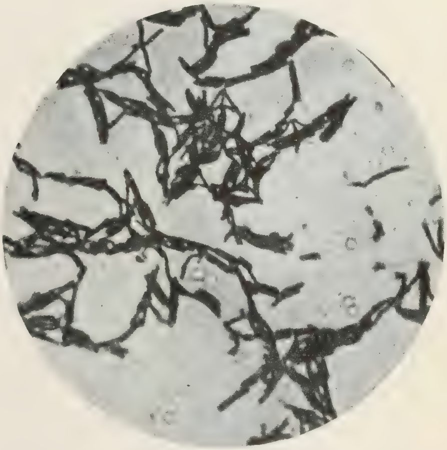
Bac. bifidus: Blood serum, 2 days, Gram st., × 2000.

FIG. 30.



Bac. Y: Agar, 4 days, Gram st., × 840.

FIG. 31.

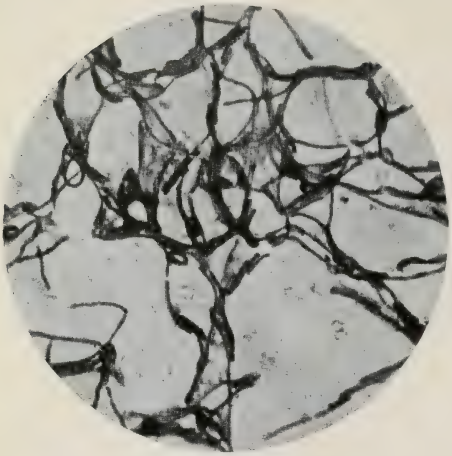


Bac. Y: Glucose-agar, 4 days, Gram st., × 840.

Bacillus acidophilus of Moro as found in dental caries is a non-motile, non-pathogenic rod. When grown on agar it is short and thick and measures 0.75 × 2 to 3 microns. It is Gram-positive. On glucose-agar the rods are longer and thinner and more distinctively arranged in groups with the individuals showing parallelism. They produce turbidity of the media. They are Gram-negative. On blood serum the rods measure 0.1 × 1 micron. They are Gram-negative, grouped as in glucose-agar.

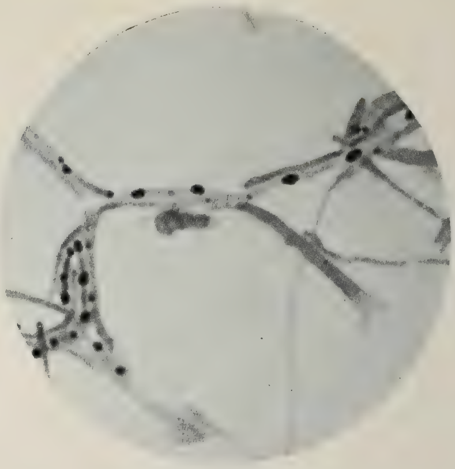
Bacillus acidophilus grows best anaerobically when first isolated by means of acid broth. In milk it clots the lower portion first. In peptone water it produces no indol or ammonia. In broth it forms a heavy sediment with some turbidity. It forms no gas in sugar. It is a facultative anaerobe and should be transplanted every ten days. It is a high

FIG. 32.



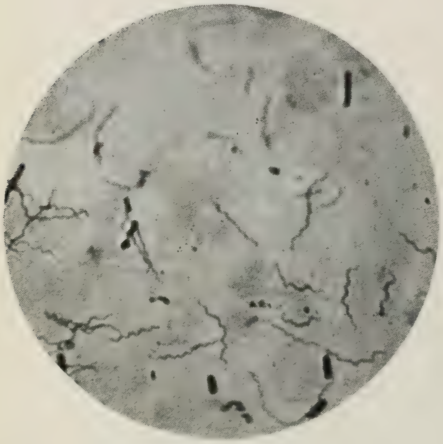
Bac. Y: Blood serum, 4 days, Gram st., × 840.

FIG. 33.



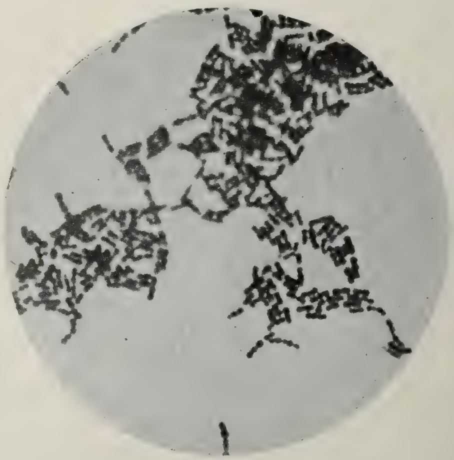
Bac. Y: Blood serum, 4 days, Gram st., × 2000.

FIG. 34.



Spirochætes.

FIG. 35.



Bac. X: Glucose-agar, 2 days, Gram st., × 1250.

acid-former. Most strains ferment saccharose, glucose, lactose, maltose, and raffinose. From 7 to 10 cc. of N/NaOH is required to neutralize 100 cc. of the bouillon. It does not ferment lactose so readily. According to the studies we have made it is not as pleomorphic as has been supposed. The colonies are slightly raised, round, smooth, opaque, and white.

Bacillus X is somewhat pleomorphic. It is Gram-positive on agar. It most frequently appears as a long chain of short, thick rods, 5 × 0.5 microns, the chains often showing parallelism. Under certain conditions the individuals are considerably longer and do not occur in chains. Moreover, smears of the organism often show only masses of long, tangled, unbroken threads, occasionally having one long thickened end. On glucose-agar many of the individuals fail to retain the Gram stain. It is an anaerobe facultatively aerobic. It produces a high degree of acidity, often requiring 14 cc. of N/NaOH to neutralize 100 cc. of the bouillon. It ferments glucose, saccharose, and levulose, but does not ferment lactose readily. It coagulates milk and does not form indol or ammonia. On Petri dishes its colonies are transparent, round, entire, slightly raised.

Bacillus M is a small, slightly curved rod, Gram-positive on agar, Gram-negative on glucose-agar and blood serum. In smears the organisms appear as bent individuals, in pairs, with concave sides facing each other, and in clusters, sometimes joined end-to-end and thus forming sectors of a circle. It possesses the same high acid-forming properties as does Bacillus X. It grows best on glucose-agar, on which it forms small, round, convex, cream-white to brownish colonies, the pigment increasing with age.

Bacillus Y is a straight or slightly curved rod with rounded and sometimes tapering ends. It measures from 1 to 2 microns × 0.2 of a micron. The cells are arranged side by side. It is Gram-positive on agar and on glucose. On blood serum it occurs in the form of rods 3 to 6 microns long, and as long, winding threads with a width of 0.5 of a micron. The ends are frequently thickened. Both rods and threads are Gram-negative and may contain one or more Gram-positive bodies. This micro-organism we have found but once or twice. We have reserved it for future study.

B. bifidus, as it appears in the carious tooth, is to be found in many forms. It is found frequently in its bifurcating state with tapering or with thickened ends, in V and Y forms, in streptococcal forms, as masses of Gram-negative cocci, as straight rods, in crosses, and as a spore-former. It is Gram-positive in young cultures. It grows aerobically and anaerobically, although according to Kendall it is a strict anaerobe. Noguchi shows it to have both anaerobic and aerobic phases. In contradistinction to his, the bifurcating form of our organism grows well aerobically after adaptation to artificial media. The colony is raised, white, entire, butyrous.

CONCLUSIONS.

(1) The Moro-Tissier group of micro-organisms is the constant and predominant flora of dental caries.

(2) These closely allied organisms from dental caries present the same morphological features as do those isolated from the intestine in nurslings.

(3) Their high acid-forming properties limit the character of the flora found in carious teeth.

(4) They possess in a greater degree than do any other organisms the attributes that are considered necessary for at least inaugurating the process of dental caries.

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10 EXETER ST.

A Report of the Results of the Use of the Carrel-Dakin Solution in Mouth Surgery.

By H. M. BECK, D.D.S., Wilkes-Barre, Pa.

THE use of the Carrel-Dakin solution as a germicide and mouth disinfectant was first suggested to the author of this article by Dr. A. T. McClintock, a bacteriologist. Dr. McClintock stated that he had used Dakin's solution in the mouth in several cases, with most gratifying results. This suggestion led to an investigation, and finally to the adoption of the solution in all of our surgical cases, to the exclusion of all other drugs, including iodin. Iodin has been considered a panacea for all mouth diseases and infections for years, and it is only recently that investigation has proved that iodin, therapeutically or bacteriologically, is anything but an ideal agent. The use of the drug has been continued only because we knew of nothing more efficient and less dangerous to take its place. Chemical sterilization of a wound or lesion can only be carried out with a strong germicide which is a non-toxic and non-irritating antiseptic. Less than 7 per cent. iodin is too weak antiseptically, and 7 per cent. or more is too irritating and toxic to be used on the delicate mucous membranes.

What is true of iodin is also true of mercury bichlorid and the carbolic group. It is a common practice of our profession to disinfect an area by scrubbing it with iodin just before injecting novocain-suprarenin. The soreness, irritation, swelling, and pain which often follow are always attributed to the novocain. Careful observation of the action of novocain-suprarenin for three years justifies the statement that the novocain is not the offending cause, and examination of the part will show irritated, inflamed, sloughing mucous membrane such as could only be caused by an iodin burn.

Dakin's solution is so much more efficient, less irritating, and less toxic than any antiseptic we ever used that we feel justified in publishing the results of our investigations, with the hope that others will try it intelligently and scientifically, and report the results of their investigations through the columns of the DENTAL COSMOS.

Wishing to ascertain if any of the New York hospitals were using Dakin's solution as a mouth disinfectant, particularly in pyorrhea cases, we wrote to the Roosevelt and the Mount Sinai hospitals, with the idea of getting a history of their cases, and comparing their results with our private work and what was being done at the Wilkes-Barre City Hospital. The answers were as follows:

(1)

June 7, 1917.

Dear Sir,—In reply to your inquiry, I have to say that the Roosevelt Hospital does use Dakin's solution, but not for mouth cases. Pyorrhea cases are not treated here.

Regretting that I cannot give you the information you desire, I am

Very truly yours,
CHAS. B. GRIMSHAW, *Supt.,*
Roosevelt Hospital.

(2)

June 6, 1917.

Dear Sir,—Dr. Markoe wishes me to say that he has received your letter, and while he has used the Carrel-Dakin solution in cases of suppuration, he has never used it in mouth cases. He regrets very much that he cannot give you the desired information.

Very truly yours,
M. E. KEARNEY, *Sec'y,*
Mount Sinai Hospital.

Other inquiries sent to various parts of the country proved that we are using more Dakin's solution in the anthracite coal region than is being used in any other section of the country—owing, probably, to the great number and character of surgical cases treated.

The formula for Dakin's solution is as follows:

Chlorinated lime (bleaching powder)	grams	200
Sodium carbonate (dry)	"	100
Sodium bicarbonate	"	80
Water	liters	10

—a very simple formula, but a very difficult one to properly compound, and an extremely dangerous preparation if not properly compounded. Mr. Jones, the expert chemist of the Wilkes-Barre City Hospital, has made a careful study of the solution, with the result that his preparation is absolutely true, scientifically and chemically. We have used it in thirty-two cases in the mouth, with the result that we have adopted it exclusively in all cases of pyorrhea, gingivitis, pericementitis—in short, in any case where a germicide and disinfectant is indicated; nor have we had any irritation following an injection of novocain-suprarenin since Dakin's solution has been substituted for iodin.

The unsatisfactory results obtained by the use of the original preparation, and the disfavor which it has acquired at the hands of some surgeons, are due to imperfection in the product—such as the persistence of alkalinity. The results we are getting are unquestionably due to the perfect solution compounded by Mr. Jones, and to the fact that we never use a solution over four days old and that it is kept in amber-colored bottles in a dark, cool place.

TECHNIQUE OF PREPARING DAKIN'S SOLUTION.

The formula and method used by Mr. Jones in compounding his solution is as given by Dr. Carrel and published in the *Journ. A. M. A.* for December 9, 1916, p. 1777. (We wish to caution the dental profession against using any but the official solution. A number of commercial solutions are now on the market, and the author of this paper would most emphatically advise the profession against their use. Those of our profession who wish to use Dakin's solution in their surgical cases will do well to keep on the safe side and use nothing but a fresh official solution until we have a more complete and scientific knowledge of its effects on mucous membrane.) The following is copied *verbatim* from the *Journal of the American Medical Association:*

> To the Editor: I have just read in the *Journal* for October 7, 1916, p. 1108, a short note about the formula for Dakin's solution. I believe that the answer will not allow your readers to obtain the proper kind of solution. Therefore, I take pleasure in sending you the description of the technique which is used in my hospital for the making of the solution.
>
> A. Carrel, M.D.,
>
> Hôp. Temp. 21, Rond-Royal,
> Compiègne, France.

Preparation of Dakin's Solution (Daufresne's technique).

Dakin's solution is a solution of sodium hypochlorite for surgical use, the characteristics of which, established after numerous tests and a long practical experience, are as follows:

(a) *Complete absence of caustic alkali.* The absolute necessity for employing in the treatment of wounds a solution free from alkali hydroxid excludes the commercial Javel water, Labarraque's solution, and all the solutions prepared by any other procedure than that which here follows.

(b) *Concentration.* The concentration of sodium hypochlorite must be strictly between 0.45 and 0.50 per cent., or it becomes irritating.

Chemicals required.

Three chemical substances are indispensable to Dakin's solution: Chlorinated lime, anhydrous sodium carbonate, and sodium bicarbonate. Among these three products the latter two are of a practically adequate constancy, but this is not the case with the first, whose content of active chlorin (decoloring chlorin) varies within wide limits; it is absolutely indispensable to titrate it before using it.

Titration of the chlorinated lime.

There must be on hand for this special purpose—

A 25 cc. buret graduated in 0.1 cc.

A pipet gaged for 10 cc.

A decinormal solution of sodium thiosulfate (hyposulfite).

This decinormal solution of thiosulfate can be obtained in the market; it can also be prepared by dissolving 25 gm. of pure crystalline sodium thiosulfate in 1 liter of distilled water, and verifying by the decoloration of an equal volume of the decinormal solution of iodin by this solution. The iodin is prepared by dissolving 1.27 gm. iodin and 5 gm. potassium iodid in 100 cc. of water.

The material for the dosage thus provided, a sample of the provision of chlorinated lime on hand is taken up from the mass, either with a special sound or otherwise, in small quantities, which then are carefully mixed.

Weigh out 20 gm. of this average sample, mix it as completely as possible with 1 liter of ordinary water, and leave it in contact for a few hours, agitating it from time to time. Filter.

Measure exactly with the gaged pipet 10 cc. of the clear fluid; add to it 20 cc. of a 1 : 10 solution of potassium iodid and 2 cc. of acetic or hydrochloric acid. Drop, a drop at a time, into this mixture a decinormal solution of sodium thiosulfate until decoloration is complete.

The number of cubic centimeters of the hypochlorite solution required for complete decoloration, multiplied by 1.775, gives the weight of the active chlorin contained in 100 gm. of the chlorinated lime.

This figure being known, it is applied to the accompanying table, which shows the quantities of chlorinated lime, of sodium carbonate, and of sodium bicarbonate, which are to be employed to prepare 10 liters of Dakin's solution.

Quantities of Ingredients for Ten Liters of Dakin's Solution.

Titer of chlorinated lime.	Chlorinated lime. gm.	Anhydr. sod. carbonate. gm.	Sodium bicarbonate. gm.
20	230	115	96
21	220	110	92
22	210	105	88
23	200	100	84
24	192	96	80
25	184	92	76
26	177	89	72
27	170	85	70
28	164	82	68
29	159	80	66
30	154	77	64
31	148	74	62
32	144	72	60
33	140	70	59
34	135	68	57
35	132	66	55
36	128	64	53
37	124	62	52

Example: If it required 16.6 cc. of the decinormal solution of the sodium thiosulfate for complete decoloration, the titer of the chlorinated lime in active chlorin is 16.6 times 1.775, or 29.7 per cent. The quantities to be employed to prepare 10 liters of the solution will be in this case:

Chlorinated lime	154 gm.
Dry sodium carbonate	77 "
Sodium bicarbonate	64 "

If crystalline sodium carbonate is being used, then instead of 80 gm. of dry carbonate it must be replaced by

Crystalline sodium carbonate 220 gm.

Preparation of 10 liters of solution.

To prepare 10 liters of the solution—

(1) Weigh exactly the quantities of chlorinated lime, sodium carbonate, and sodium bicarbonate which have been determined in the course of the preceding trial.

(2) Place in a 12-liter jar the chlorinated lime and 5 liters of ordinary water, agitate vigorously for a few minutes, and leave in contact for from six to twelve hours—over night, for instance.

(3) At the same time dissolve, cold, in the other 5 liters of water the sodium carbonate and the bicarbonate.

(4) Pour all at once the solution of the sodium salts into the jar containing the chlorinated lime mixture, agitate vigorously for a few moments, and leave it quiet to permit the calcium carbonate to settle as it forms. At the end of half an hour, siphon the liquid and filter it through double paper to obtain an entirely limpid product, which must be protected from light.

Light, in fact, quite rapidly alters solutions of hypochlorite, and it is indispensable to protect from its action the solutions which are to be preserved. The best way to realize these conditions is to keep the finished fluid in large wicker-covered demijohns of amber glass.

Titration of solution.

It is a wise precaution to verify, from time to time, the titer of the solution. This titration utilizes the same material and the same chemical substances as are used to determine the active chlorin in the chlorinated lime:

Measure out 10 cc. of the solution, add 20 cc. of 1 : 10 solution potassium iodid and 2 cc. of acetic or hydrochloric acid. Drop, a drop at a time, into this mixture a decinormal solution of sodium thiosulfate until decoloration is complete.

The number of cubic centimeters employed multiplied by 0.03725 will give the weight of the sodium hypochlorite contained in 100 cc. of the solution.

A solution is correct when, under the conditions given above, from 12 to 13 cc. of decinormal thiosulfate are required to complete the decoloration:

13 × 0.03725, or 0.485 per cent. of NaOCl.

Test for alkalinity of solution.

It is easy to differentiate the solution obtained by this procedure from the commercial hypochlorites and from Labarraque's solution. Thus: Pour into a glass about 20 cc. of the fluid, and drop on the surface a few centigrams of phenol-phthalein in powdered form. Dakin's solution, correctly prepared, gives absolutely no change in tint, while in the same conditions Javel water and Labarraque's fluid give an intense red coloration, which in the latter two solutions indicates the presence of free caustic sodium.

METHOD OF USING DAKIN'S SOLUTION.

Use of the solution in pyorrhea. One of the diagnostic signs of pyorrhea is inflamed, bleeding gums about the necks of the teeth. Often the inflammation is so marked and the bleeding so excessive that thorough prophylactic treatment is almost impossible. To overcome this condition, have the patient rinse the mouth every four hours with Dakin's solution for two days before presenting himself for the prophylactic treatment. The operator will find, after two days' treatment with Dakin's solution, that most of the inflammation and bleeding has subsided, and that the heretofore painful scaling and polishing of the teeth can be effected with little or no pain. After the prophylactic treatment use the solution in a glass syringe with a platinum needle, as described later in Case 5. If the solution reaches the point of infection without being diluted with saliva the flow of pus will stop in a few hours. If the pus persists, the solution has not reached the seat of infection and the treatment should be continued. In extreme cases of pyorrhea where very large and deep pockets are found we have used the following treatment with most gratifying results: First, the pocket and surrounding tissue is walled off with cotton rolls and kept as dry as possible. Then a small pellet of cotton is saturated with Dakin's solution and inserted into the pocket, packing it about the neck of the tooth and well down into the pocket. Caution: The packing should not be tight. This dressing should be changed every four hours for two days, and usually the flow of pus will cease in two or three treatments. If the flow of pus stops, the cotton dressing should be omitted but the pocket should be flushed out with the solution for three or four days. In several bad cases where it seemed impossible to reach the point of infection with Dakin's solution, we have inserted a fine wire into the pocket, made a radiograph to ascertain the location and depth of the pocket, and with this help have succeeded in getting Dakin's solution to the seat of infection and have been able to arrest the flow of pus.

Treatment following root amputation. Spray the wound every two hours with Dakin's solution. Use no other drug or treatment, and the result will be all that could be desired. Caution: Do not use more than 10 lb. pressure in the atomizer; a spray forced into a wound of inflamed tissue with 25 lb. or 30 lb. pressure is most injurious.

Method of disinfecting the mucous membrane before hypodermic injections of novocain-suprarenin. In conductive anesthesia or in local injections, spray the mouth first with Dakin's solution, and after a few minutes wipe off the mucous membrane with 70 per cent. alcohol about the area where the needle is to be inserted. Just before injection, again wipe the point of insertion with Dakin's solution. Caution: Do not scrub the part to be disinfected with Dakin's solution—simply wipe it off; and do not use Dakin's solution immediately before or after using iodin, menthol, benzol, or any of the numerous iodin preparations.

Before using the solution in the mouth, we would advise those who are interested in the Carrel-Dakin method of wound sterilization to read the splendid paper by Dr. W. O'Neil Sherman, published in the March 1917 issue of *Surgery, Gynecology, and Obstetrics,* also in the *Penn-*

sylvania Medical Journal for June 1917. On July 31st the writer had the privilege of meeting Dr. Sherman and discussing a paper written by him and read before the Schuylkill County Medical Society at Buckwood Inn. We were very much impressed with Dr. Sherman's paper and with the very great stress he laid upon the necessity of using the Daufresne technique in preparing the solution, of always using a fresh solution, and of following the technique of Dr. Carrel *verbatim* in using the Carrel-Dakin solution in the treatment of wounds.

On page 847 of the August number of the Dental Cosmos Dr. H. J. Kauffer explains the method of sterilizing root-canals with Dakin's solution. His method is very interesting, and although we have not tried it as yet, we feel sure the results following his technique would be most gratifying. I cannot agree with Dr. Kauffer, however, that there is such a thing as a stable Dakin's solution. We would not think of using a solution on the delicate mucous membranes if it were more than four or six days old, and would much prefer having an absolutely fresh solution.

On the stability of Dakin's solution, Dr. Sherman, in his paper in the *Journ. A. M. A.* for July 21, 1917, pp. 185–191, makes the following statement:

The Coleman laboratories have prepared several hundred gallons of Carrel-Dakin solution (made according to the technique of Daufresne) and have been frequently asked, "How long will the solution hold up?" In order to answer this question intelligently they made a series of experiments with solutions kept under various conditions, and tested them at frequent intervals to note the rate of decomposition. The formula used in the preparation of the solution has been published, and is known as the Daufresne technique, as used by Carrel. The concentration of sodium hypochlorite in the solution must be exactly between 0.45 and 0.50 per cent. Below 0.45 per cent. the solution is not sufficiently active; above 0.50 per cent. it becomes irritating.

A series of six half-pint bottles were filled with a solution containing 0.52 per cent. sodium hypochlorite and kept as indicated in Table 1.

Table 1.—Conditions under which Solutions were Kept.

No. of solution.	Kind of bottle.	Conditions.
1.	Amber.	Kept in closet on shelf near floor.
2.	Flint.	Same as No. 1.
3.	Amber.	Shelf in laboratory, getting diffused daylight, but no direct sunlight.
4.	Flint.	Same as No. 3.
5.	Amber.	By window, getting afternoon sunlight.
6.	Flint.	Same as No. 5.

Table 2.—Results of Tests.

Days	*1*	*5*	*7*	*14*	*19*	*21*	*26*	*31*	*35*	*40*
Sample 1	0.522	0.522	0.514	0.510	0.510	0.510	0.510	0.510	0.506	0.506
" 2	0.522	0.522	0.514	0.510	0.510	0.510	0.510	0.510	0.506	0.506
" 3	0.522	0.522	0.514	0.510	0.510	0.510	0.510	0.510	0.506	0.502
" 4	0.522	0.516	0.502	0.487	0.480	0.476	0.469	0.461	0.450	0.413
" 5	0.522	0.510	0.495	0.480	0.476	0.473	0.465	0.458	0.435	

Ten cc. were taken from each bottle, and 20 cc. of 10 per cent. potassium iodid solution, and 20 cc. of acetic acid (36 per cent.) were added and titrated with tenth-normal sodium thiosulfate solution, after first being standardized against tenth-normal iodin solution. The results are given in Table 2.

The figures show that—

(1) A solution kept in a clear glass bottle exposed several hours a day to direct sunlight decomposes quite rapidly and is useless after several days.

(2) The same solution kept in an amber bottle under the same conditions decomposed

much more slowly and was satisfactory until thirty-one days after the first exposure.

(3) The solution in a flint bottle, exposed only to diffused daylight, remained satisfactory for thirty-five days.

(4) The same solution in an amber bottle, exposed under the same conditions, shows a much slower decomposition, and is still satisfactory at the end of forty days.

(5) The two solutions kept in a closet on a shelf near the floor, in flint and amber bottles, respectively, have shown no difference in the rate of decomposition as far as the bottles are concerned. Both solutions are going down slowly, and both contain 0.506 per cent. sodium hypochlorite at the end of forty days' trial.

Note: Impure bleaching powder contains lime, and this, when acted upon by water and sodium salts, yields a soluble sodium hydroxid which neutralizes the hypochlorous acid, giving sodium hypochlorite. An excess of this soluble alkali may account for the persistent alkalinity of Dakin's solution.

It is impossible to have a solution containing chlorin or hypochlorous acid, or sodium hypochlorite, that will remain unchanged in constitution or reaction when allowed to stand or when subjected to light or to differences in temperature.

The writer wishes to acknowledge his indebtedness to Dr. W. O'N. Sherman, to Dr. L. H. Landon, assistant chief surgeon Carnegie Steel Co., to Dr. Lynn, Dr. McClintock, Dr. Mengal, and Mr. Jones, of the City Hospital staff, to Prof. Wm. Dean, chemist for the Spring Brook Water Co., and to the W. D. White Pharmacy, for assistance in preparing this report.

REPORT OF CASES.

Case 1. (Reported by Dr. W. L. Lynn of the City Hospital, Wilkes-Barre.) Miss A., mill-worker, age thirty-three. Denied venereal disease. About nine years ago she developed stomatitis due to dye poisoning from one of the anilin dyes which she handled while working in a local mill. Her tongue became very tender and swollen; soon ulcers and fissures appeared. She was treated medically and used all of the antiseptic and astringent mouth-washes available. The ulcers finally cleared up, but the fissures persisted, the pain at times being excruciating. The tongue presented a slightly hypertrophied appearance on admission to the hospital May 21, 1917. The tongue showed bluish purple with deep fissures and considerable hemorrhages. A Wassermann test was made May 18th, which proved positive. Dakin's solution—of the Dakin-Carrel formula as made in the hospital —was started May 21, 1917. Since the use of the solution the tongue has cleared up, the patient has very little or no pain; also, the cervical glands, which had been enlarged, decreased greatly in size and the fissures practically closed. The whole appearance of the patient was greatly improved, but an entire cure was not effected.

Case 2. (Referred by Dr. Stewart.) Miss H., age thirty-eight. Gold crown on right upper second molar; third molar missing. The tissue surrounding the crown for an area of two and a half inches showed white, similar to an acid burn or arsenical poisoning. Considerable sloughing in area immediately adjacent to crown. Pain continuous, at times intense. Treated by country physician and finally pronounced malignant. Upon examination both Dr. Stewart and the writer agreed that the case was not malignant, but due to local causes. The crowned tooth was removed under conductive anesthesia using novocain-suprarenin, and the entire area curetted with surgical burs. The mouth was syringed with Dakin's solution every two hours for the first two days, after which the patient rinsed the mouth with the solution every two hours. At the end of two weeks the wound was entirely healed and presented a most healthy appearance, and the pain had entirely stopped.

Case 3. Mrs. C., age twenty-eight. Beautiful teeth, well cared-for; no pyorrhea, little or no tartar; microscopic examination showed very few endamœbæ; no stomach trouble, general health good. Patient not pregnant. The gums started to bleed and puff up some two months before patient presented herself for treatment, every known mouthwash having been used. Examination showed the gums very much inflamed, purple in appearance and bleeding at the slightest touch. The patient was ordered to take internally a teaspoonful of bicarbonate of soda in half a glass of water after meals. Dakin's solution was used as a mouthwash every two hours. After two days of this treatment the bleeding had stopped, and the gums, although puffed, had changed from a purple to a healthy color. The bicarbonate of soda solution was continued and Dakin's solution used as a mouthwash every four hours instead of every two hours as at first. After ten days' treatment the gums were perfectly normal and healthy and the patient was discharged, but was advised to present herself every week for examination. No treatment of any kind was used after the patient was discharged, and after six weeks the gums were still in perfect condition.

Case 4. Miss D., age thirty-three. Had twenty-eight good teeth. Three third molars extracted; a lower left third molar had not erupted. Three radiographs taken at different angles failed to reveal the tooth. Miss D. had been a patient of my father's since her childhood and until his death, after which I was retained as her dentist, and thus have a complete history of the case. Her teeth were regulated and put in perfect occlusion and relation by Dr. C. S. Beck and remained in position for seventeen years. After that time, without any apparent cause, the central incisors began to space and twist out of place, the gums about the centrals taking on a purplish appearance. There was no pus. A retaining Jackson appliance was made to place and hold the teeth in position, and in a few days a little pus was discovered exuding from about the necks of the teeth in question; Dakin's solution stopped this within two days. Such a condition as described always indicates a serious intestinal disturbance, which should be recognized by the dentist.

Urinary analysis revealed the following: *Morning*—Sp. gr. 1026, reaction acid. Albumin: Negative. Phosphates: Some. Sugar: Negative. Uric acid: Heavy ring. Indican: Large amount. Microscope: Many epithelial cells and amorphous urates; no casts. *Night*—Sp. gr. 1025, reaction acid. Albumin: Negative. Phosphates: Heavy. Sugar: Negative. Uric acid: Heavy ring. Indican: Large amount. Microscope: Loaded with amorphous urates; no casts. Here was shown conclusively a serious intestinal putrefaction which, if allowed to continue, would eventually produce an incurable infection.

The patient was deprived of all red meats and excessive sugar, and given light physical culture exercises, increasing them as rapidly as improvement warranted. Dakin's solution was used at night as a mouthwash. In six weeks she had gained five pounds and showed marked general improvement.

Case 5. Mrs. E., age thirty-five, having twenty-nine splendid teeth; three third molars extracted. Has child two years old. After the birth of her child the patient developed a slight case of pyorrhea with just a suggestion of recession of the gums about the anterior teeth. The entire mouth was radiographed, but no apical abscesses were found. The attention of the family physician was called to the condition, and his examination showed slight kidney disturbance, with indican and low specific gravity. The pyorrhea responded to the usual treatment, and after three months the kidneys cleared up. While the pyorrhea remained passive, it was not cured, and the patient was subject to continual treatment for a year and a half. The Carrel-Dakin treatment, finally, was used—as follows (ensuing precautions being taken, not because we feared a burn from the chlorin, but because we do not feel justified in taking chances with any powerful drug): First, the saliva ejector was placed in the mouth; the tongue and cheeks protected with a cotton roll, and a piece of gauze in the floor of the mouth over the tongue. With a hot-air syringe the gums about the teeth affected were dehydrated so that the tissue was almost dry. Then with a glass syringe and platinum needle having a flat point the Dakin solution was flowed all over the gums and down into the pockets around the teeth and allowed to remain for five minutes. (Caution: Never use Dakin's solution in anything but a glass syringe with a platinum needle, as the chlorin very quickly corrodes steel.) The same treatment was used in the lower jaw, after which the patient was told to rinse the mouth with the solution every two hours for two days. At the end of that time no trace of pus could be found; the microscope showed no endamœbæ, and not a hundredth part as many of the various bacteria usually found in an infected mouth. For the rest of that week Dakin's solution was used as a mouthwash every four hours, with the result that the pyorrhea is apparently cured. Weekly examinations for six weeks showed no return of the pyorrhea, and the mouth was still in perfect condition. The patient was instructed to use Dakin's solution as a mouthwash each night just before retiring.

68 West Northampton st.

Excision of the Alveolar Process.

By EARL H. WESTENHAVER, D.D.S., Kansas City, Mo.

IN presenting this subject to the profession, I do not claim originality, but wish only to point out the merits of such a procedure, giving its advantages, and also the technique which has produced the best results.

My attention has often been called to the necessity for this procedure where the mouth was to be prepared for a full upper or lower denture, or both, and also where bridges are to be placed shortly after extraction of teeth that are of no further value. We have been taught the methods of constructing temporary artificial dentures, some of which have proved satisfactory and some otherwise.

The purpose of excising the process is twofold, viz—(1) To produce practically the same results at a single operation which it would require nature months or years to do, and (2) to hasten the healing of the tissues, which would necessarily enable the placing of a permanent artificial denture in a much shorter period of time after extraction than is customary under the usual procedure.

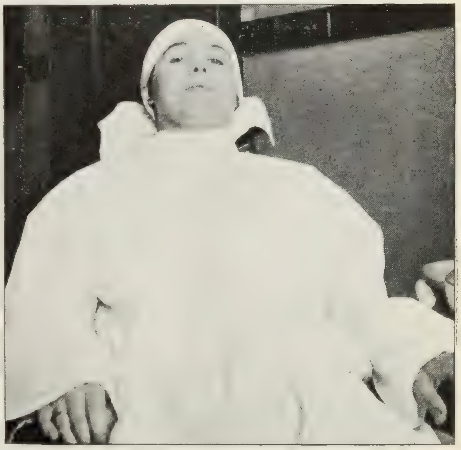
We know that after the loss of the teeth the alveolar process has practically served its function, and that absorption begins almost immediately. Some cases require a much longer period for this process of elimination than others, but so far we have no means by which to stimulate the activity of the osteoclasts; therefore I believe it much better to surgically remove this tissue.

The operation is done at the time the teeth or remaining roots are removed, and the anesthetic used is novocain-suprarenin, in a 2 per cent. solution, blocking the various sensory branches of the fifth cranial nerve. In order to do this the operator must be thoroughly familiar with the technique of nerve-blocking.

PREPARATION FOR THE OPERATION.

Having decided to excise the alveolar process, the patient is prepared for the operation the night before in the same manner as for any minor surgical operation.

Fig. 1.



The preparation at the chair consists in the thorough cleansing of the mouth by the use of cotton swabs, antiseptic sprays used in the atomizer, and lastly by a 20 per cent. solution of the following:

Acidi tannici, Pot. iodidi,	} āā	dr. j
Tinct. iodidi,		dr. vj
Mentholis,		gr. xv
Alcoholis (50 per cent.), Glycerini,	} āā	oz. j
Aquæ dest.,	q.s. ad	oz. iv

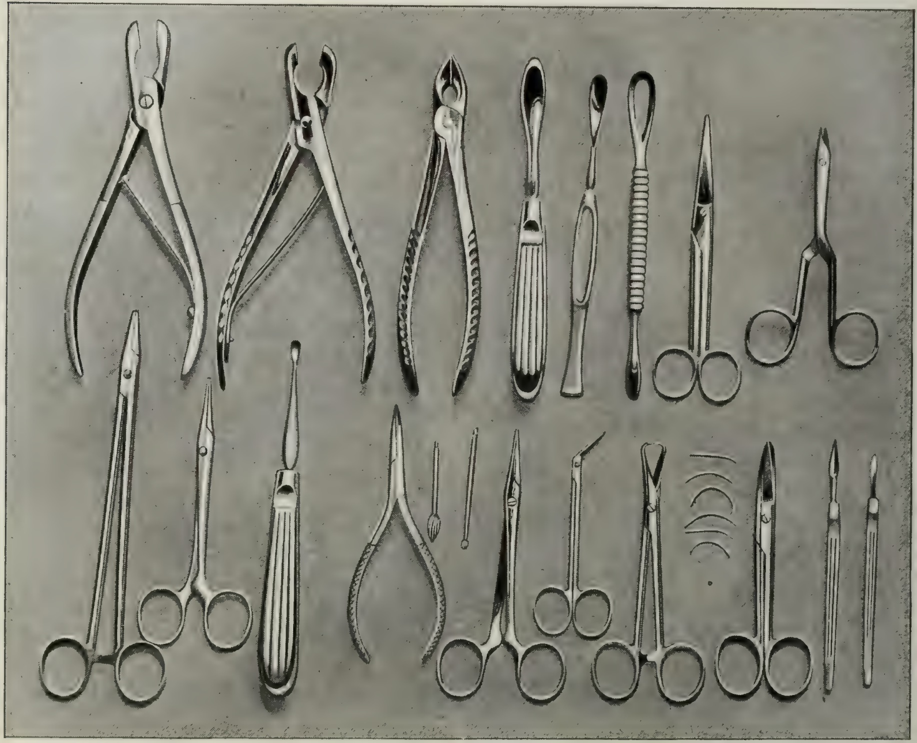
—used in an atomizer.

Fig. 1 shows the patient prepared for the operation, which begins with the blocking of the various sensory nerves, the technique of which I shall not give here.

TECHNIQUE OF THE OPERATION.

Fig. 2 shows the set of instruments the author has found most valuable for this operation. These are as follows: Hegar's needle-holder. Curved Luer rongeur. Straight Luer rongeur. Horsley's bone-forceps. Leitz' cutting forceps. Bulldog curved scissors, 1 sharp point. Mayo's dissecting scissors, Weiss preferred. Straight Kelly hemostat. Curved Kelly hemostat. Backhaw's 5½-inch forceps. Scherk's angular scissors. Double-edge furuncle knife. Ballanger-Hajeck's elevator, semi-straight. Whiting's mastoid curet, small. Goodwillie's periosteal elevator. Adams' dry dissector. There may be other instruments which will serve the purpose as well as those shown in Fig. 2. This feature is simply a matter of judgment for the operator to decide.

Fig. 2.

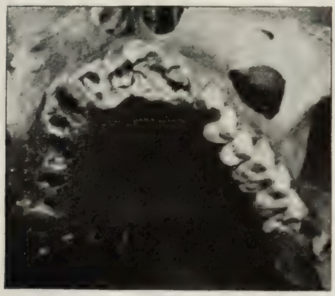


Having removed the teeth (see Fig. 3), an incision is made over the crest of the alveolar ridge, and the process is exposed by the use of periosteum elevators of various types. (See Fig. 2.) After this process has been exposed, as in Fig. 4, the excising forceps are used for removal of the process, the density of which will be a guide as to the kind of forceps needed for a given case.

I do not want to be understood as attempting the complete removal of the process from the body of the inferior or superior maxillary bones; the extent to which it should be removed must be left to each individual case, as it would be impossible to establish an ironclad rule which could be applied to all cases.

During the operation the mouth should be irrigated freely by using a hot 3 per cent. iodin solution. It will be necessary to curet, and also to use bone burs in order that no spiculæ of bone be left. The excising and curetting having been completed, the parts should be irrigated again. At this point the tissues should be brought to approximate each other—viz, the palatal, buccal, and labial. These tissues should meet as nearly over the crest of the ridge as possible, the margins being trimmed until we have surfaces which will come in contact over the newly formed ridge. The suturing is now commenced in the region of the tuberosity by the use of curved needles (see Fig. 2), using for the suture iodized catgut No. 2 and the so-called buttonhole stitch as shown in Fig. 5.

FIG. 3.



CONSTRUCTING THE TEMPORARY DENTURE.

Immediately following the completion of the suturing, an impression is taken in plaster of Paris, and a cast run for the purpose of constructing a temporary denture, before the patient leaves the operating chair. The author's method for constructing such a temporary denture is to secure an impression in plaster, then run a cast from impression plaster, and construct a base-plate using Graft's base-plate material in the same manner as for taking the bite previous to constructing an artificial denture, the base-plate being trimmed so as not to leave any sharp edges. It is then tried in the mouth.

The next step is to place the eight anterior teeth on the plate, attaching them with S. S. W. black impression compound. Now we apply the compound to the denture at places corresponding to the location of the second bicuspid and the first and second molars. This is done for the purpose of giving the patient something upon which to rest the jaws. It is not intended that this temporary denture shall serve in masticating food, but only as a means by which medicinal agents may be kept in contact with the tissues.

FIG. 4.

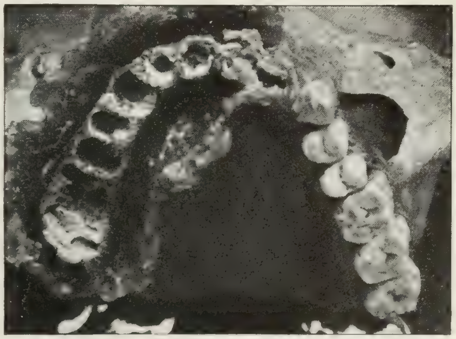
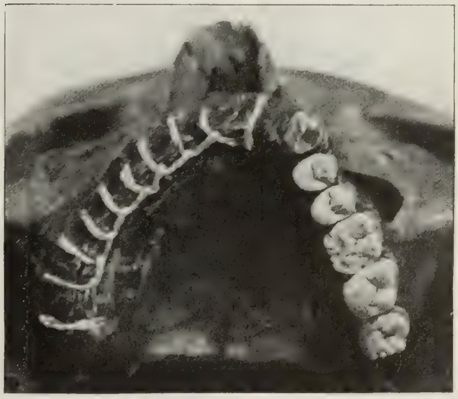


FIG. 5.



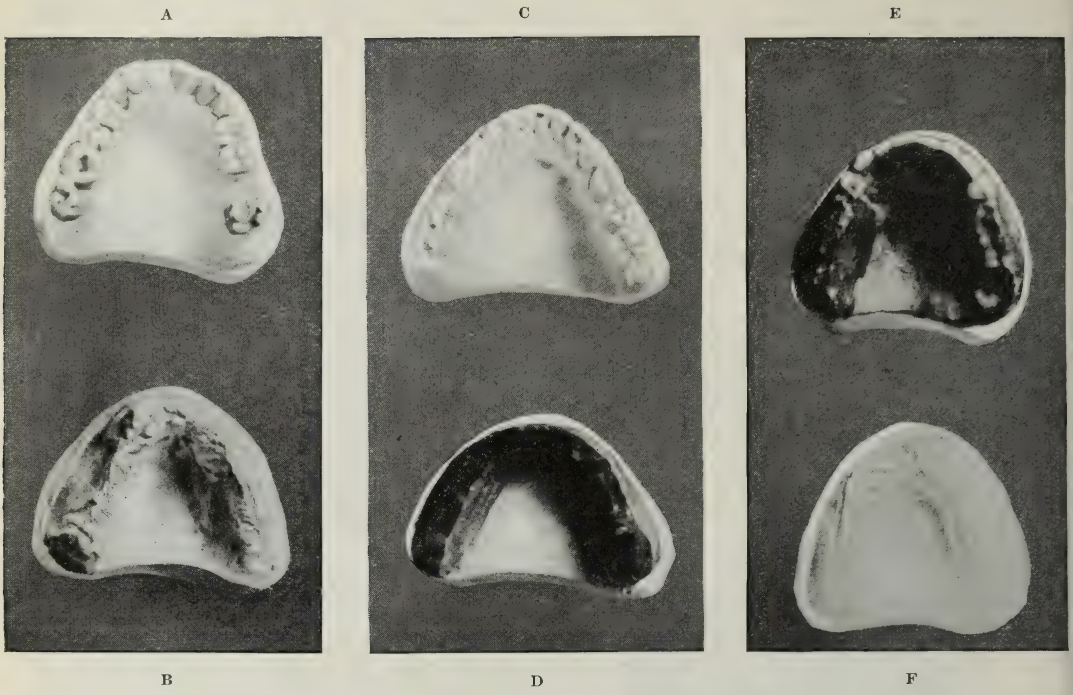


Fig. 6.

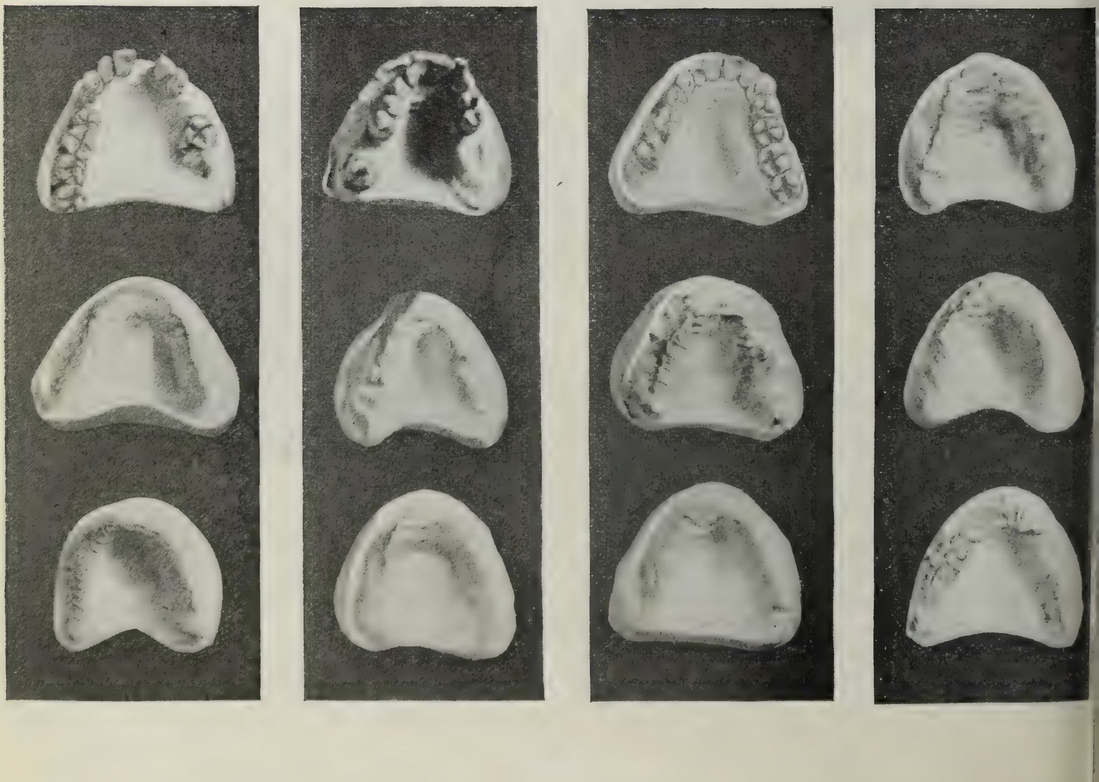


Fig. 7.

CARE OF THE MOUTH AFTER OPERATION.

The patient is now ready to be dismissed with the following instructions and medicinal agents: Iodin, 5 per cent. solution with the direction that it is to be diluted one-half with hot water and the mouth washed thoroughly every two hours for the first twelve to eighteen hours. The temporary denture is coated on the maxillary surface with Beck's bismuth paste, which will be kept in contact with the tissues by the denture being held firmly in position. In all cases novocain powder must be incorporated into the bismuth paste in the following proportion:

Bismuth paste (Beck's)	oz. j	
Novocain (powdered)	gr. viij.	M.

Considerable swelling may follow on the second day, but with no alarming symptoms. This may be taken care of by cold applications.

The author has observed that the average lapse of time necessary until the permanent denture may be constructed is approximately fifteen days.

Fig. 6 shows casts of full upper and lower dentures, before extracting and excising and immediately afterward. The case immediately after completion of suturing is seen at B. At D is shown plate with bite ridge so as to afford rest to the jaws. At E, temporary plate carrying eight anterior teeth. At F is shown a cast of the upper, fourteen days after operating, at which time a permanent denture was constructed.

Fig. 7 shows a number of cases before and after operating, and the results obtained.

816 LATHROP BLDG.

Oral Prophylaxis and Periodontoclasia.

By LOUIS MEISBURGER, D.D.S., Buffalo, N. Y.

(Read before the Pennsylvania State Dental Society, Philadelphia, June 26, 1917.)

MR. PRESIDENT AND MEMBERS OF THE PENNSYLVANIA STATE DENTAL SOCIETY:

IT affords me great pleasure indeed to appear before you at this time, and present for your consideration an essay on "Oral Prophylaxis and Periodontoclasia." When approached upon the subject of reading you a paper there was but one subject uppermost in my mind—namely, that indicated by the above title; but, conscious of so much having been written and said on the subject, I wondered whether I could possibly say or do anything that would be sufficiently attractive to you to make the undertaking worth while.

There is evidently a lack of convincing proof of what has been accomplished along the lines of oral prophylaxis in periodontoclasia, as otherwise its value as a preventive and remedial agent would be more generally recognized, accepted, and practiced. Much still remains to be learned as to the etiology, pathology, morbid anatomy, etc., of conditions relating to oral disturbances; but I feel safe in saying that enough evidence of the vast benefit derived from thorough prophylaxis and surgical interference in periodontoclasia is at hand to warrant our standardizing the work for the greatest good of suffering humanity.

May I ask your indulgence for a moment to recall the incident that attracted my attention to the great good to be derived from the proper cleansing of the teeth, and which I am sure would attract many others had they enjoyed the privilege accorded me some few years ago here in your city. I was attending a meeting in Washington of what at that time, if my memory serves me correctly, was called the Southern Branch of the American Dental Association, at which gathering I listened to an essay by Dr. D. D. Smith. Upon his invitation, and in company with several of my co-laborers, I visited his office a few days later, and we were there accorded the privilege of examining mouths that had been under Dr. Smith's care.

Oral prophylaxis is nothing new, as we find that the early Romans used astringent washes, and Servilius Damocrates, a Greek physician, who acquired great renown in Rome toward the middle of the first century, attached the greatest importance to the cleanliness of the teeth, as he considered this necessary in order to avoid diseases of the teeth and gums. And I might quote many similar instances in history, but time forbids.

ORAL PROPHYLAXIS DEFINED.

"Oral prophylaxis" is a term applied to any procedure designed to prevent diseased conditions of the teeth and periodontal tissues. Oral prophylactic treatment is a systematized periodic treatment designed to maintain the health of the teeth and contiguous tissues.

Prophylaxis and periodontoclasia must of necessity be considered under one head, as many cases of the latter would not occur if prophylactic measures had been taken—by this I mean, had the patient received prophylactic treatment at regular or necessary intervals. And this, gentlemen, is my position: Fully realizing that malnutrition and lowered vitality owing to systemic disturbances are great factors always to be considered, I yet maintain that much constructive work is being done while little attention is given to the most essential thing which must obtain to make that work lasting—namely, the keeping of the tissues of the mouth in a normal condition. How often do we see a beautiful filling or piece of crown work upon teeth whose surrounding tissues we know were not in a healthy condition at the time it was placed! Such a case came to my notice only a very short time ago—a bridge that was a splendid example of mechanical skill, while yet the two teeth upon which abutments were placed were badly affected.

Our real duty is not to see how many teeth we can fill, but how many we can save from decay. Another duty is to bring about a healthy condition of the mouth either by surgical interference or therapeutic treatment; and our responsibilities are not at an end until we have educated our patients in the care necessary on their part in maintaining a healthy condition after it has been established.

I cannot emphasize too strongly that without the co-operation of our patients we cannot hope for success in our work, and I might add that this brings home to us one of the most discouraging phases with which we have to contend. It is astonishing to find patients otherwise faultless in dress and personal habits who have no conception of the necessity of the toilet of the mouth. Again, however, while a large proportion of our *clientèle* have never been taught the proper care of the mouth, yet upon proper enlightenment they become ideal in their habits.

The moral of all this is that our patients must be taught how to care for the mouth, and as we have the means at our command to know whether or not our instructions have been followed, we can, if we find them shirking, warn them of the dire results and indicate in no uncertain terms that we will not be responsible for their negligence.

WHAT CONSTITUTES PROPHYLACTIC TREATMENT.

What is meant by prophylactic treatment? I can give you no better answer than that given by the originator of this systematic treatment. It consists of an enforced radical and systematic change of environment of the teeth and perfect sanitation for all organs of the mouth; experience having demonstrated that the most careful and painstaking are unable, with the agents commonly employed, as the toothbrush and dentifrice, toothpick and dental floss, soaps and so-called germicidal washes or other agencies, to effect this end. The plan of forcible, frequently renewed sanitation by an experienced operator has been found indispensable.

In detail, oral prophylaxis consists of the most careful and complete removal of all concretions, calcic deposits, semisolids, bacterial plaques and inspissated secretions which gather on the surfaces of the teeth, between them, or at the gum margins. This operation should be followed by thorough polishing of all tooth surfaces by hand methods (power polishers should never be used), not alone the more exposed labial and buccal surfaces, but the lingual, palatal, and proximal surfaces as well—using for this purpose orange-wood points, shoe-pegs, etc., in suitable holders charged with material of the operator's choosing. Treated in this manner the teeth are placed in the most favorable condition to prevent and repel septic accumulations and deposits, and as well to aid all efforts of the patient in the direction of cleanliness and sanitation.

To my mind nothing short of the above procedure meets the requirements of prophylaxis.

At this point a short quotation from a paper read by Dr. E. B. Spaulding seems much to the point. He says that one, two, or three treatments do not constitute prophylaxis. It is the constant watching, guarding and maintaining the mouth in a condition of health, which constitutes oral prophylaxis.

Prophylaxis should start with the eruption of the deciduous teeth and an occasional visit to the dentist. Parents and nurses should be taught the use of a polisher and ribbon floss, and to watch for and remove all foreign substances such as gather on the teeth of most children. Fissures of molars and bicuspids should be covered with cement until such time as you feel the patient will give them proper care.

A FEW PROPHYLACTIC "DON'TS."

At this point I wish to add a "don't" or two.

Don't neglect to restore lost contact points.

Don't set a crown or bridge (that is, if you must use a bridge) without thoroughly cleaning the abutments. Oftentimes teeth upon which fixed pieces are attached are subjected to the influences that obtain in the oral cavity for several days before the completed piece is attached.

Don't apply an orthodontic appliance without exercising the same precautions with regard to teeth used as anchorages.

Don't allow your patients who are wearing removable pieces to go away without sounding the usual and everlasting warning that they must call at regular intervals for prophylactic treatment.

Don't use fixed bridges except in very small cases, as we have at present many devices and ways of supplying the missing links which are most acceptable to patients of refined taste. I wish to lay special emphasis on "refined taste."

Adults should receive thorough prophylactic treatment at such intervals as in your judgment they require, usually from one to three months. Ideal prophylaxis treatment should bring a child to manhood or womanhood with a fairly sound set of teeth, few fillings, and with a knowledge of how clean teeth feel.

Acquaint your patients with the purpose of the disclosing solution, and the benefits to be derived from its use.

Tell them of the normal pink appearance of the mucous membrane and of the greatly enhanced appearance of such a mouth. Explain to them that those highly sensitive spots at the cervical margins can be eliminated.

Tell them of the relatively small number of cavities you find in a mouth receiving these treatments, the effects of which are truly preventive and marvelous—the old proverb about the "stitch in time" being particularly applicable here.

Tell them that these treatments establish and maintain in the tissues a higher degree of resistance to disease. Tell them that many cases of so-called pyorrhea are thus positively prevented.

The working tools consist of hand polishers, tape of various kinds, polishing materials, XXX silex, No. 60M carborundum powder, broad flat wooden points and No. 12 wooden shoe-pegs. Sodium citrate as a polisher, especially for children, will not clog the mucous glands as will pumice. Sodium citrate is a neutral crystalline powder which will dissolve mucoid deposits, according to the investigations of Dr. Geo. W. Cook; it is not in itself a solvent of tartar, as it does not attack inorganic substances.

STEPS TO BE FOLLOWED IN THE PROPHYLACTIC TREATMENT.

Spray the mouth with some mild antiseptic solution; remove calculus from the teeth, polish them and remove stains by the use of wood polishing-points (broad and flat) charged with pumice, finely pulverized silex, sodium citrate, etc.

Sodium citrate is used by dipping the polishing-point in a liquid of your choosing and picking up the crystals on the point. If pumice is indicated it may be used dry or moist. For this purpose phénol sodique or hydrogen dioxid, a mild antiseptic, and water, have been found very helpful.

When more or less of gingivitis resulting from the presence of a local irritant is present the writer has found pleasing results from the use of a paste made with Hogue's preparation of campho-phénique and pumice applied just at the seat of inflammation with shoe-pegs in the carrier. The staining solution is now used to check up your work. If found satisfactory, pieces of No. 4 cotton rolls in a Kuroris holder are dipped in dry oxid of tin slightly flavored, and the surfaces of the teeth polished. This gives an added luster to the teeth. No. 2 Salter's tape is now passed between all the teeth. The mouth is again sprayed with a mild antiseptic solution, using enough pressure to dislodge any remaining pumice or whatever agent has been used.

The mouth is then carefully examined and a chart made indicating lost contact points, high spots, cavities, or decalcified enamel, abnormalities of any of the investing tissues, malocclusion, etc., and the patient given a five-minute talk on the advantages of a clean, healthy mouth, and the care necessary to maintain it in that condition.

PERIODONTOCLASIA.

Periodontoclasia is the process of destruction of the tissues immediately surrounding the teeth, according to the nomenclature adopted by the American Academy of Oral Prophylaxis and Periodontology.

Many attempts have been made to introduce terms more descriptive of the pathological features of this disease, but none appear to have been used as extensively as pyorrhea alveolaris. As there are many phases of the latter-named condition, I use the term Periodontoclasia, as adopted by the members of the above-mentioned institution; also in the hope that, inasmuch as all members of this body are directly interested in this condition of so-called pyorrhea, we may adopt this classification with the aim of at least standardizing this portion of the work—an end very much to be desired!

As I have said, it is not my purpose to lay before you the reports of scientific men who are laboring to give us exact knowledge as to the etiology of this distressing condition; that would mean a repetition of what you have already read or listened to, and what is as yet of a decidedly uncertain nature. In saying this I beg to assure you that nothing is farther from my mind than to underrate the efforts of the men who are giving their time, energy, their very existence, to furnish us with data that will enable this condition to be treated more intelligently and with exact scientific knowledge. It is not within the domain of all to prosecute research work, and of necessity that portion of this work must be delegated to men who are mentally equipped to enlighten us on that phase of the subject.

It must be discouraging to men who listen to our deliberations on this and kindred subjects to find, when all is said, that they cannot take home and to their patients something that has been subscribed to by at least a majority of those who have taken part in the discussion of a paper. Our journals are fairly teeming with essays dealing with the subject of so-called pyorrhea, and yet an analysis of them all finds a decided diversity of opinion as to the etiology, treatment, and prognosis of this disease—some claiming that all cases are local manifestations of a systemic condition; others, that it is of a purely local character. Some favor medication and only moderate scaling, relying upon the resistance given the tissues by their treatment to inhibit further deposits and consequent destruction; others favor thorough scaling and removal of all necrotic tissues, with mild stimulation, while still others favor the vaccines. I am very sorry and loath to say that a large majority do not give their patients any hope, dismissing them with a prescription of some widely advertised nostrum possessing all virtues that a wildly imaginative brain can attribute to it, and concocted for the convenience of the dental profession, who, the purveyor knows, are very eager to adopt the many "good things" offered in commercial fields.

DIVERSITY OF OPINION AMONG EARLY WRITERS AS TO THE ETIOLOGY OF PYORRHEA.

In 1875 Dr. John W. Riggs, in a paper read before the American Academy of Dental Surgery, attributed periodontoclasia to local causes, claiming that it was due to calcific deposits, and that the removal of these deposits almost invariably led to a cure. These conclusions were in direct antagonism to the views previously presented by E. Magitot, who maintained that the disease was due to systemic factors, having recognized its frequent appearance in patients of the rheumatic type. Both investigators regarded the thorough removal of all deposits as an essential feature of the treatment. In this regard there is at the present time, among men who are giving this subject much thought, a general unanimity of opinion.

For the past thirty-five years or more the respective views of these two early investigators as to the etiology of so-called pyorrhea have been steadfastly advocated, and today the followers of each are about equal in number, with probably a steady augmentation in the camp of those who contend that the clinical features grouped together as pyorrhea in some instances belong to a class the etiology of which unquestionably is to be found in abnormal states of nutrition and metabolic change, just as Magitot contended forty-five years ago. The followers of Riggs, on the other hand, insist that all clinical manifestations of periodontoclasia are entirely due to causes operating through the oral cavity, and with their thorough removal a permanent cure can be established in almost every case. Both groups appear to be well fortified with records and patients to prove their contentions. It cannot be denied that many patients can be shown who stand as conclusive testimony of the excellent results obtained by local means. However, the diversity of opinion as to the etiology of pyorrhea—and indeed this seems to be the most discussed phase of periodontoclasia—is no more definitely conclusive at the present time than was the case twenty-five or thirty years ago, opinion still being divided as to whether it is local or systemic.

An interesting symposium of papers recently published in the *American Medical Journal* by eminent men in both professions attracted my attention as being proof of my contention that we are still far apart as to any certain and united thought.

The papers referred to dealt with "The Bacterial Findings and Their Relation to Periodontoclasia," "The Roentgen Ray in Diagnosis," "Differential Diagnosis," and "Some Studies in the Treatment of Pyorrhea Alveolaris."

With regard to the subject of the first paper, we have as yet not been able to isolate any special organism responsible for the causation of pyorrhea. The X-ray has been and is a very valuable adjunct in diagnosis, but we must not lose sight of the value of clinical evidence. As to differential diagnosis, the author of the paper says with assurance that the variations in clinical appearance of the gums and pericemental tissues point with unerring fidelity to the cause of the dyscrasia. It is his contention that the periodontoclasia is but a reflection of the predisposing cause.

The author of the essay on "Some Studies in the Treatment of Pyorrhea Alveolaris" speaks of this condition as being an infectious disease, to be treated as such. He also takes up the regeneration of cementum, and contends that under proper conditions cementum has the power to regenerate, even if it has been cut in grooves or removed entirely from the root, provided a sufficient amount of cementum is left on the root from which regeneration can take place.

DIVERSITY OF OPINION AMONG PRESENT-DAY WRITERS AS TO THE ETIOLOGY OF PYORRHEA.

Just a few more comparisons worthy of consideration, coming as they do from men pre-eminent in our profession, yet holding opposite views:

Dr. Talbot says that the etiological factors of this disease are both local and constitutional. The constitutional are irritating substances absorbed from the bowels as well as retained waste material due to faulty work by the eliminative organs of the individual; the local factors being those with which we are all familiar, plus one which I would like to add—faulty bands of orthodontic appliances and wires, which often cut the delicate proximal tissues and cause in many instances a permanent injury.

Professor Znamensky shows a number of well-prepared sections of the human jaw demonstrating inflammation of the alveolar process. Znamensky's conclusions are essentially that the irritant leading to bone destruction initiates lesions in the gum margins, which extend gradually to the alveolar bone. He thus differs from Dr. Talbot, drawing as he does a somewhat different set of conclusions from the studies of the sections of the diseased tissues.

A later observer who has done most excellent work (A. Hopewell-Smith) is led to the conclusion that the morbid conditions of the jaws which produce the flowing of pus are not etiological factors of severe metabolic disturbances of the alimentary tract or vascular system, but that they are part and parcel of them. He concludes by stating that, at best, treatment can only be palliative, and unfortunately only directed to the prevention of further destruction, not to the rehabilitation or reconstruction of parts that are forever and absolutely destroyed.

These splendid studies still leave us in the dark, and unfortunately leave the impression in the mind of the reader that the treatment of periodontoclasia is a comparatively useless and hopeless undertaking.

Talbot has not endeavored to differentiate pyorrheal inflammations into respective types, but leaves the impression in the mind of the student that they are part and parcel, to use the words of Hopewell-Smith, of severe metabolic disturbances of the alimentary tract and vascular system.

If this were all of the truth it would discourage rather than encourage the average dentist in his efforts to combat this disease. None of the three authors quoted has called attention to the relation which exists between the tooth-root surfaces and continued infection. This relation was pointed out by Dr. Hartzell in a series of studies in which the pathology of the root surface was worked out. It is shown that the root surface when once laid bare through resorption processes becomes a culture-bed for many types of bacteria, and that the leucocytes fail in their office because the porous character of the root surface is of such a nature that it is impossible for them to reach the bacteria in the pitted surfaces. Dr. Hartzell voiced the opinion, which is corroborated by many observers, that a gingivitis invariably precedes a pyorrheal inflammation, but that such gingivitis need not be of bacterial origin—inflammation of the tissues contiguous to the thin edge of the process being entirely sufficient to stimulate resorption of its margin. The factor leading to the gingivitis may be of the simplest character, soon passing away and leaving in its train nothing to mark the fact that an irritant had ever been present, so far as the appearance of the tissues would show. The fact that any bone had been lost could scarcely be appreciated except by the keenest search. Nevertheless, real damage has been done from which the patient never recovers unless the pitted root surface thus far exposed to infection be surgically removed.

The reason for the foregoing statement is found in the porous nature of the root surface itself, and explains why many absolutely healthy individuals show resorption of bony process and the formation of deep pockets—individuals whose eliminative processes are seemingly perfect, the specific gravity of whose urine is normal, whose digestive processes are apparently perfect, but who show marked destruction of the alveolar margins.

I believe that we fully agree with the view that destructive inflammation of the alveolar process is accentuated by irritants of constitutional origin; but certainly the constitutional factors do not play a greater or more important part in inflammations involving alveolar process and gums than these same constitutional factors would play in other local inflammation.

I might continue for an indefinite time laying before you facts corroborative of my contention that the thinking minds prominent in our profession are still divided on this important question. My appeal, and my plea to you, is that we have at present many men in our ranks who are doing much good in arresting —if you please, if you object to the word "cure"—the destruction of tissues which ends in the exfoliation of the teeth. We could not voice our sentiments in such strong language many years ago, but at present there are many practitioners giving all or a great part of their time to oral prophylaxis and periodontoclasia, and we point with great pride to their work and its results.

If you give as much time to making yourselves proficient in this work as you did in perfecting your technique in other branches, I promise that the results will be worthy of your efforts.

At this point let me make a few suggestions with regard to diagnosis of periodontoclasia. Make a careful diagnosis, and do not class all gingival inflammations as cases of periodontoclasia. Digital examinations are most essential, and will detect troubles of the gingivæ and gum tissue that the eye will not discover. Instrumental examination must of course not be overlooked. Demonstrate to your patient the necessity of early treatment; do not wait for deep pockets to form and the teeth to loosen. Show the patient a healthy and an unhealthy area. Thrust the instrument into pockets gently, and then do the same in a normal area. This will be convincing proof to the patient as to the necessity for interference.

INSTRUMENTATION AND MEDICATION.

Use such instruments as will do the planing to a limited depth and at the same time have sufficient clearance to dispose of the planed material. The instruments must be accurate. All cutting edges should be centered in line with the center of the handle of the instrument, so that all instruments are in effect straight though the shafts may be crooked to enable the operator to reach places which are otherwise inaccessible. This allows the operator to hold the instrument lightly and enables him to exercise a more delicate sense of touch.

When you have a single root of a multi-rooted tooth that is denuded of its pericemental attachment, other roots being in fairly good condition, the affected root may be completely excised.

I do not advocate the use of local anesthesia in root surgery, as we are liable to remove healthy tissue. A tissue not anesthetized serves as a guide for the careful operator in locating and following pockets to the end; and treatment can be accomplished with little or no pain to the soft parts involved. Great care should also be taken not to injure the soft tissue when planing roots.

Medical treatment following surgical interference after the polishing has been completed consists in spraying the mouth with a warm antiseptic solution to remove loose deposits or pumice which has remained from the polishing. If you feel that a mild astringent is indicated, keep the parts dry with a napkin or cotton rolls and apply the astringent.

Instruct the patient in thorough mouth hygiene, proper brushing, taping, gum massage (for this I find the Indexo finger toothbrush very useful), etc. A 5 per cent. solution of iodin is a mild and efficient stimulating agent. The constant use of strong astringent washes is, in my opinion, wrong. Certain tissues of the mouth need to be constringed and stimulated to healthy activity, but the entire mucous membrane surely does not need to be so treated. Cook in a series of experiments on dogs has shown that the continuous use of astringent washes interferes for hours with the action of ptyalin upon starchy foods.

Permanent splints should be avoided, as they are very filthy appliances, and are open to the same objection that fixed bridges are; and again, loose teeth with no hope of recovery will sooner or later have to be removed.

At this point I wish also to mention a few agents and appliances that I have found very useful in everyday practice.

"Hogue's prescription": A camphophénique which is non-escharotic in its action. Mixed with pumice it makes an ideal preparation to use with wood polishing-points, and is also a valuable remedy for use by the patient:

Camphor,	100 parts.
Phenol,	36 "
Alcohol,	4 "

The following gutta-percha compound is useful for the retention of one or two roots which are being rested after treatment:

White base-plate gutta-percha,	9 parts.
Pure beeswax,	1 part.

As a staining solution I use the following:

Iodin (crystals),	gr. 45
Pot. iodid,	gr. 15
Zinc iodid,	gr. 15
Glycerin,	ʒiv
Aqua,	ʒiv

Antiseptic solution for use at chair:

Carbolic acid,	℥iv
Oil wintergreen,	ʒj

Sig.—About five drops to glass of water.

For splinting, Angle's wire or No. 31 brass wire is very useful.

As holders for wooden shoe-pegs I use Harrell's porte-polishers. If your supply house cannot furnish these, they may be purchased from P. J. Kester, Masonic Temple, Chicago, Ill.

VACCINES IN THE TREATMENT OF PYORRHEA.

Vaccines I shall touch upon but briefly. When you have thoroughly and carefully removed all deposits and infected tissues, the employment of a vaccine except in an infection which is self-limiting has not been of any real value in cases coming under my observation.

As a general principle it would seem that any infection which is self-limiting should be controllable by an immunizing serum. This is in accord with the theory that the poison eliminated by the causative organism stimulates the formation, by the tissues themselves, of an antibody which destroys the effect of the microorganism. Such a serum may be employed to establish immunity, or it may be administered soon after exposure, or at the beginning of an attack, and may either prevent the attack entirely or materially moderate it. In this group of diseases a more or less permanent immunity is established by the use of serum.

In the use of serum to control suppuration it is not expected that immunity will be established. The patient may be cured of the particular attack, but there will be no lasting effect against another similar attack. Many cases of periodontal disease have been reported as much improved by the use of serum, just as pyogenic infections in other parts have been benefited. There has, however, been no cure of the pus pockets by such treatment, even though the discharge of pus might have been temporarily stopped. If vaccines are used they should be autogenous and not stock vaccines.

MALOCCLUSION AS A FACTOR IN PERIODONTOCLASIA.

I have purposely avoided the question of malocclusion as a factor in periodontoclasia and periodontia until the closing section of my paper, thinking possibly that the last word may linger longer in your memory.

Malocclusion is one of the most important factors in the etiology of this disease, as its presence means a continued disturbance. Unequal stress on the teeth must be eliminated at the outset. Carbon paper is used to locate prominent points. By placing the finger on the suspected teeth and having the patient close the jaws several times the operator is able to find and determine which teeth need grinding.

Another vital and all-important essential in the treatment of periodontoclasia and periodontia is the restoration of lost contact points.

I wish also to impress upon your minds that the scaling of deposits is not what we mean when we refer to surgical treatment of periodontoclasia. The surgical treatment also includes the thorough removal of any infected pericemental tissue that may act as a constant source of irritation if not removed.

I trust I have awakened in your minds an appreciation of the value of oral prophylaxis, with the object of securing a healthy and hygienic mouth and sane surgical interference, as an aim having promise of great good—one worthy of your efforts, for *united* effort must be productive of the greatest good.

85 N. Pearl st.

Practical and Efficient Methods of Anesthesia.

By JULIAN A. ZABROCKI, Ph.G., D.D.S., Chicago, Ill.

(Read before the Northwest Branch, Chicago Medical Society, May 25, 1917.)

THIS is the first time I have had the pleasure of coming before this society to read and discuss a paper on one of the most important and at the same time most grossly neglected subjects in the practice of modern medicine and surgery. There has been more scientific research work done on the physiologic action and administration of anesthetic agents on man and lower animals, more valuable literature compiled on anesthesia, during the past five years than has been done previously since its introduction half a century ago.

I do not mean to convey the impression that this paper covers the entire field of anesthesia. I shall endeavor, however, to touch briefly on the practical and modern methods of anesthesia in the light of our present-day knowledge.

By the words *practical and efficient* I mean (*a*) That the anesthetic should be suited to the patient and should be modified or changed entirely as indicated; (*b*) the introduction should be pleasant to the patient, with respiration, blood pressure, color, and reflex continuing normal; (*c*) the maintenance of anesthesia should vary with the surgeon's needs, while at the same time the patient's condition should be as nearly normal as possible; (*d*) the transition from the anesthetic stage to the natural should be as gradual and as smooth as the induction, the patient emerging from the anesthesia, as from a quiet sleep, without pain, nausea, or vomiting.

All of this can be accomplished by modern methods not yet in common use in our hospitals and teaching clinics, and not encouraged by most of our surgeons employing a routine method and a nurse anesthetist. The adoption of any one method or anesthetic, regardless of conditions, is entirely wrong, and is contrary to the fundamental principles that should govern all surgical procedures and the administration of all drugs.

It is most unfortunate for humanity that many prominent surgeons pay little or no attention to the choice of anesthetic agents or methods employed, or who shall administer the anesthetic. He is, however, extremely careful in the selection of his assistants, and in carrying out his technique and asepsis to the letter.

It is almost impossible for the surgeon to keep up with the literature of his own specialty. That he is not up to date on the methods of administration of anesthetics is proved by the type of anesthesias witnessed in some of the best known hospitals and clinics of today.

A specialist in anesthesia should have full control of this department, with the required number of visiting anesthetists and assistant anesthetists, in every large hospital, in every medical school, and in every teaching clinic. It should be included in the curriculum of every medical and dental college, and before a student is graduated he should be required to pass a satisfactory examination both in the theory and practice of all anesthetics. The nurse anesthetist has proved to be practical mechanically, scientifically lacking and dangerous.

I take it for granted that this society wishes anesthesia discussed under the higher meaning of the words "practical and efficient," and this I propose to do as briefly as possible.

PREPARATION OF PATIENT AND ORAL PROPHYLAXIS IN RELATION TO ANESTHESIA.

In the writer's opinion the hurry or lack of proper preparation is responsible for more deaths than can be attributed primarily to the anesthetic. At least forty-eight hours should be allowed for the preparation of the patient upon admitting him to the hospital.

It will be assumed that any pathological condition of the mouth, such as caries of the teeth, abscessed teeth, alveolar abscess, infected tonsils, or sinuses, will have a detrimental effect upon the whole bodily economy. Any condition which lowers bodily resistance will have a harmful effect upon the patient receiving an anesthetic. He should be given sodium bicarbonate and lactose, of each one dram, every four hours, for at least forty-eight hours before the operation. If the urine is already acid the dose of sodium bicarbonate should be increased. Glucose per rectum should also be given after the operation.

PRELIMINARY MEDICATION.

The consensus of opinion is that almost every patient should have some form of preliminary medication, otherwise a rise of blood pressure at the very thought of the operation, together with other changes, prevents smooth induction, easy maintenance, and uneventful recovery, which we otherwise would obtain.

In preference to morphin, which is a standard routine in some hospitals, I prefer the following preliminary medication —modified, of course, to suit the individual case:

℞—Paraldehyd or chlorotone,
Kali bromid, āā ʒj to ʒij
Aqua dest., q.s. ad ℥iv. M.

With the patient in the Sims position, this is administered per rectum one-half to one hour before operation. This medication possibly has the same effect as morphin seems to have, *i.e.* it regulates the acidosis; in fact, Crile recommends bromid for this purpose. Where a narcotic is indicated, codein phosphate, one-fourth to one-half grain, may be substituted for morphin.

Chloroform, anesthol, and ethyl chlorid are rarely used as general anesthetics; as an analgesic in minor cases, or as the initiatory agent to supplement other anesthetics they are indicated, but should be employed with caution. In emergency practice, when chloroform is used, it is much safer and better to surround the mask with a paper cone or towel and maintain rebreathing throughout, thus diminishing by one-half the quantity of anesthetic used. Dipping the chloroform bottle in hot water from time to time increases its safety.

Essence of orange, composed of 25 per cent. of oil of bitter orange peel and 75 per cent. absolute alcohol, is not in itself an anesthetic, yet its odor is about twenty times as penetrating as that of other vapors, which makes it a safer and better introductory agent to ether anesthesia by the semiclosed or closed methods.

The physiological basis for the beneficial effects of essence of orange in the administration of inhalation anesthesia may be found in the prevention of reflex stimulation of certain sensory nerves. Dastre attributed early syncope to reflex stimulation of the pneumogastric and the trigeminal nerves, particularly the sensory branches supplying the nasal mucous membrane and the larynx.

Embley found that failure of respiration is mainly due to fall in blood pressure; with good blood pressure, failure of respiration is practically impossible. Restoration of respiration is dependent upon restoration of blood pressure. The chances of vagus inhibition are greatly increased by the imperfect respiration. It would seem fair to assume that any factor which prevents inhibition of the nervous mechanism of respiration and which, by its stimulation of respiratory centers, prevents fall in blood pressure, will have the desired influence upon the course of anesthesia.

The essence of orange seems to exert this beneficial influence by dulling the sense of smell to such an extent that the odor of the ether is not noticeable during its administration.

The open-drop ether method is a crude, unscientific method and is responsible for all the ill repute that ether anesthesia bears today, especially as regards nausea and vomiting. Administered by the best anesthetists in the world it is irregular and uneven, with a tendency to acidosis.

The so-called nitrous oxid-ether sequence is even a cruder and more dangerous method than the open-drop method. The duration of nitrous oxid anesthesia is approximately forty seconds, and to establish narcosis with this method it is absolutely necessary to overwhelm the patient with ether, and induce anesthesia rapidly, or he will come out of the nitrous oxid anesthesia, which will defeat the form of ether anesthesia desired. The nitrous oxid-ether sequence should not be used, because it raises the blood pressure enormously, cyanoses the patient, and is responsible for many deaths.

In our present-day knowledge of anesthesia there is no excuse for the continuance of these crude and unscientific methods.

PERFECTED METHOD OF ETHERIZATION.

The essence of orange, ethyl chlorid, and ether anesthesia by the semiclosed method is the method of etherization I prefer. I employ a Ferguson inhaler, which is essentially a double-chamber mask with a facepiece made of flexible wire to conform to the shapes of different faces. The facepiece is covered with eight or ten layers of wide-mesh surgical gauze, which are clamped into position by a spring; the superstructure is covered with a flannelet bag or hood having a drop hole above or on the side of the inhaler, depending on the type of operation for which the anesthetic is administered. One to two cc. of essence of orange dropped on the mask will satisfy the olfactory sensibilities of the most fastidious patient. Ethyl chlorid is now dropped or sprayed on the gauze of the vaporizing chamber in minimal amounts. After a few inhalations the drop or spray is increased, and when the patient's respiration becomes deeper and rhythmical ether is added synchronously with the ethyl chlorid until positive signs of ether anesthesia present themselves. This stage of preliminary anesthesia lasts from forty-five to ninety seconds or more in different subjects; the average individual will require from 3 to 5 cc. of ethyl chlorid; the obese and alcoholic from 5 to 9 cc., depending upon whether the ether is used synchronously before the ethyl chlorid is discontinued. If this transition is expertly done and the ethyl chlorid and ether are not crowded until consciousness has been lost and reflexes abolished, the patient will go under the anesthetic without any noticeable stage of excitement, with good pink color, respiration and pulse normal, and an even, deep, safe anesthesia is maintained with about half the amount of ether used as compared with the old method. The patient also revives with little or no discomfort.

OIL-ETHER COLONIC ANESTHESIA.

Oil-ether colonic anesthesia is now a recognized method of administering ether. It has been successfully employed and conclusively demonstrated in over 2000 cases by such experts as Dumont, Cunningham, Buxton, Leggett, Churchhill, Sutton, Lathrop, Lumbard, Foote, Morton, and last, but not least, our friend, Dr. James T. Gwathmey of New York City, the untiring research worker, to whom all credit is due for perfecting oil-ether colonic anesthesia.

It is not my purpose in this paper to go into the physio-pathological aspect of colonic anesthesia. I shall therefore adhere to the practical side of my subject, dividing it as follows: Preparation of patient, preliminary medication, technique of rectal anesthesia, post-operative treatment, indications, contra-indications, and advantages.

PREPARATION OF PATIENT.

The night preceding operation a laxative is administered, usually castor oil or phenol-phthalein, followed in the morning by enemata of warm tap-water or a weak soapsuds solution, one hour apart, until the return is clear, when the patient should be permitted to rest for two or three hours. One hour before operation administer per rectum a solution of one-eighth grain morphin, one to two drams of paraldehyd, three-and-a-half drams of ether, and three-and-a-half drams of olive oil. In cases of athletes, alcoholics, and patients weighing over 160 pounds, the paraldehyd solution should be repeated. For the average patient, do not repeat the dose.

TECHNIQUE AND APPARATUS.

The simplicity of the apparatus required for this method is a decided point in its favor: A special rectal tube one-fourth inch in diameter and about twenty-eight inches long, a clamp for this tube, and a small glass funnel with which to introduce the ether-oil solution, and a Gwathmey rectal irrigating tube to withdraw the solution or flush the colon.

DOSAGE.

The dosage or formula is as follows: One ounce of 65 per cent. solution of ether in olive oil for every twenty pounds of body weight in the normal adult. This percentage should never be exceeded; six ounces of a 65 per cent. solution is the usual dose for the average case and will maintain anesthesia for two-and-a-half to three hours, provided a clear airway is maintained. Not more than eight ounces should ever be given.

For children under six years of age a 50 per cent. solution should be employed without the preliminary medication. This mixture is non-irritating and easily retained, and is followed by a satisfactory anesthesia in from ten to twenty minutes. For children of from six to fifteen years a 50 to a 65 per cent. solution without the preliminary medication should be given.

INDUCTION.

With the patient in the Sims position in bed, twenty to thirty minutes before the operation, the ether-oil mixture is poured very slowly, allowing one minute for the introduction of each ounce through the funnel attached to the rectal tube, which has been well lubricated and partially filled with oil, inserted four inches into the rectum, and clamped; at the very least, five minutes should be consumed in administering six ounces, which is the usual dose for the average case. Full narcosis is reached in from ten to thirty minutes; should the patient go to sleep before the required amount has been given, STOP! If narcosis is delayed, a few whiffs of ether or chloroform on a mask may be used. It is advisable not to withdraw the rectal tube, but leave it within the rectum, clamped.

POST-OPERATIVE TREATMENT.

Immediately upon conclusion of the operation, or when the sutures are inserted, the clamp on the tube is released, and the residual mixture siphoned off, the colon or Gwathmey tube is inserted alongside of the rectal tube about six inches into the rectum; one gallon of cold soapy water is poured into the funnel and siphoned off by the colon tube. At the same time, massage the abdomen gently from left to right to expel the remaining liquid. The Gwathmey tube is now withdrawn, and two to four ounces of olive oil is injected and the rectal tube withdrawn, the patient returned to bed, and a cold saline enema, one pint, every four to six hours, is ordered.

INDICATIONS.

Oil-ether anesthesia is indicated for neurotics, and in those in whom the element of fear predominates, in all operations upon the respiratory tract, head, neck, mouth, jaws, chest, goiter, tonsil, and adenoids, abdominal operations and hernia reductions, and patients suffering from tuberculosis, pulmonary abscess, pneumonia, and empyema.

Oil-ether anesthesia is contra-indicated in all pathological conditions of the lower bowel, such as colitis, hemorrhoids, ulcers, and fistula, and in emergency cases.

ADVANTAGES OF OIL-ETHER ANESTHESIA.

From my personal experience and the experience of a large number of prominent surgeons and anesthetists, and from a review of all the available literature on colonic ether-oil anesthesia, I feel sure that the limits of safety are wider than with any other known method of anesthesia. This method prevents shock; narcosis is smooth and of uniform depth; pulse and respiration remain near normal; there is little or no change in blood pressure; the reflexes are not disturbed; more complete relaxation is secured; the stages of excitement characteristic of inhalation are eliminated; loss of heat is minimized during operation because of the diminished sweating and ether refrigeration; hypersecretion of mucus and saliva is absent; there is less hemorrhage in mouth, head, and neck surgery, and the patient's lungs, stomach, and kidneys are spared.

NITROUS OXID AND OXYGEN ANESTHESIA THE LUXURY OF ALL INHALATION ANESTHETICS.

With the advance of science, technique, and the perfected gas-oxygen apparatus now available, and with certain modifications, nitrous oxid and oxygen anesthesia has proved to be 100 per cent. efficient. It is possible to anesthetize all patients for any form of surgical operation.

I have administered nitrous oxid and oxygen anesthesia in thousands of cases, with and without ether sequence, and for every conceivable form of operation, without a single death.

Dr. George W. Crile of Cleveland, Ohio, the inventor of anoci-association, or nerve-blocking anesthesia in combination with nitrous oxid and oxygen anesthesia and analgesia, reports 15,000 cases without a single death primarily due to anesthesia. With the improved technique of medication and nerve-blocking, warmed vapor of nitrous oxid and oxygen, even flow of both gases, with positive interpulmonary pressure, and definite percentages of oxygen, Crile has discarded ether altogether.

I have perfected a technique of nitrous oxid and oxygen anesthesia which I have employed for the last seven years with excellent results, equally gratifying to the surgeon, patient, and myself.

The elements of success in nitrous oxid and oxygen anesthesia are: A regulated pressure apparatus, even flow of both gases in definite percentages, ether attachments, vapor-warmer, positive interpulmonary pressure, and rebreathing.

TECHNIQUE OF NITROUS OXID AND OXYGEN ANESTHESIA.

The pressure valves in the apparatus are set at thirty pounds pressure on the nitrous oxid side and fifteen pounds on the oxygen side, the gas being allowed to flow at the rate of 120 gallons per hour. After five or six inhalations of pure nitrous oxid, the oxygen is started at the rate of eight gallons per hour, and increased one gallon or more at a time as the case requires, until the rate of twenty-five gallons per hour of oxygen is reached. The oxygen should not be increased unless the patient becomes cyanosed, when a few inhalations of oxygen will bring back a good pink color. In the majority of cases it is not necessary to alter the percentages of gases throughout the entire operation. In anemics and weak individuals, a slight increase of oxygen and a decrease of nitrous oxid is indicated. In alcoholics it is sometimes necessary to modify the nitrous oxid-oxygen anesthesia by the addition of from 8 to 12 per cent. of ether vapor until the desired relaxation is obtained, when the ether can be discontinued and nitrous oxid and oxygen administered to the completion of the operation.

Five mm.Hg of positive pressure is used with a certain amount of rebreathing; a more profound anesthesia is obtained when using positive pressure than when not using it. The accumulation of carbon dioxid in rebreathing has its beneficial effects as a respiratory stimulant.

In tonsillar and adenoid operations, oral operations, and for the extraction of teeth, the same technique is employed, with the exception that, while the mouth is open, as air will gain entrance to the lungs, it is necessary in these cases to increase the nitrous oxid pressure and flow of gases from 160 to 250 gallons per hour. A special nasal inhaler and mouth tube is used; profound anesthesia is established in from two to five minutes, and maintained indefinitely to the completion of the operation.

In recent experimental research work into the nature of nitrous oxid and of ether anesthesia by Crile, he has shown that nitrous oxid and oxygen anesthesia resembles normal sleep. During normal sleep the histologic changes in the brain, adrenals, and liver due to excretion, emotion, infection, and acidity are repaired. During nitrous oxid anesthesia also the lesions in the brain cells due to these causes are repaired.

Nitrous oxid protects the brain against histologic changes due to infection, while ether increases the damaging effects of infection.

Anesthesia is, then, an induced acidity. The decreasing alkalinity may so nearly approach the neutral point that even circulation and respiration are suspended, and acid death or anesthetic death follows.

In conclusion, I wish to impress upon you the necessity for the surgeon and the anesthetist alike to realize that during the operation each is draining the store of reserve alkalinity. Therefore prepare your patient properly, reduce acidosis, and increase the alkalinity as much as possible before operating. Good team work is absolutely essential to success in surgery and anesthesia. Give your patient the luxury and benefit of modern anesthesia. In bad risks and infections, nitrous oxid and oxygen anesthesia is preferable to ether. Nitrous oxid and oxygen should be employed whenever a skilled anesthetist is available.

Nitrous oxid-oxygen anesthesia is established in from three to five minutes without the characteristic struggle, and the patient comes out of the anesthetic in a few minutes when the inhaler is removed, regardless of the duration of the anesthetic and without nausea or vomiting.

In the majority of cases food can be taken the same day, and the period of convalescence is shortened by one-half.

The writer's personal experience covers a period of ten years, with thousands of nitrous oxid-oxygen administrations, without a single death, and as knowledge and experience accumulates he is able with increasing accuracy to adapt the anesthetic to the individual patient.

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25 E. WASHINGTON ST.

A Closer Relationship Between the Physician and the Dentist in the Management of Systemic Disease Through Mouth Infection an Imperative Need.

By I. N. BROOMELL, D.D.S., Philadelphia, Pa.

(Read before the Susquehanna Dental Association, Allentown, Pa., May 22, 1917.)

I AM prompted to present this subject for your consideration for two reasons: First, because the necessity for so doing has so forcibly and consistently been urged by many influential members of the medical profession; and second, because some reform in the relationship now existing between medicine and dentistry is necessary if dentistry is to increase its efficiency and maintain its dignity.

In the beginning it must be pointed out that whatever disagreement there may be between the two professions, this should not be taken as a unanimous action. Especially is this true in all reference which will be made to the medical profession, because it is to the minority rather than the majority of these that reference will be made. While the attitude of the medical profession relative to dental disorders has hitherto been largely one of indifference, indications are not now lacking that medical men generally are awaking to a more enlightened appreciation of the importance of the mouth and teeth as a possible causative factor in systemic disease, as well as a potent agency in the progressive deterioration of the race.

At no time in the history of dentistry as a profession has there been such a need for the assistance and co-operation of the medical profession as at present, and to this may be added the satisfying declaration that at no time have the latter, as a class, shown more willingness to accommodate the former in this way.

DENTISTRY AS A SPECIALTY OF MEDICINE.

In a consideration of this subject it must not be forgotten that dentistry is not a fully recognized specialty of medicine, and it is doubtful if it can be, so long as the course of study and methods of practice include mechanics combined with operative and surgical procedure. It may also be said that the ambition to become a full-fledged specialty of medicine is not a unanimous desire among the dental profession, a majority of whom perhaps are inclined to believe that the most satisfactory results can be attained without such coalition. Indeed, it has been intimated at times that dentistry has no rightful claim to professional recognition, just as the mechanical procedures of the surgeon, be they ever so skilful, have at times endangered his professional standing.

In an address made some time ago by Sir Thomas Barlow to the students of the National Dental Hospital and College of London, he characterized dentistry as "to a considerable extent a profession," and as a partial definition of what constitutes a profession remarked that he "regarded as professions such callings as the Church, the Law, and Medicine, in which one man consulted another as to his line of action in a given case, and the professional man for the moment became the absolutely skilled adviser. The advice given was entirely irrespective of any advantage he might himself derive from it; that was the first part of his professional duty, and the work of a dental surgeon was in that sense just as much professional as the work of the doctor."

In commenting upon the foregoing, the late Professor Litch remarked that the fundamental idea in this not very lucid or convincing definition doubtless was that true professionalism must be chiefly a service of brain and not of hands, and that just in proportion as any work becomes the task of muscle rather than the effort of mind, its professional character is lowered.

Owing to this conventional distinction, in England the surgeon who with knife and saw amputates a limb or by manual effort reduces dislocations or constructs splints to hold fractured, displaced, or distorted bones in place has always been regarded as inferior in social position to the physician, whose chief office is thought to be the writing of prescriptions for remedies supposedly curative of disease—the physician becoming in turn a "tradesman" when he dispenses for a profit the drugs he prescribes. While these statements may have carried some weight at the time they were made, they are doubtless much less forceful today, and it is now a well-established fact that dentistry, while a separate and distinct profession, recognizes in medicine its elder brother, a controlling and wholesome influence, and on this account the best humanitarian results can only be attained by an harmonious unity of purpose between the two.

RELATIONSHIP OF ORAL SEPSIS AND CONSTITUTIONAL DISEASE.

Miller's work in 1889 calling attention to oral sepsis as a possible causative factor in constitutional disease failed to attract, in any substantial way, the interest of medicine or dentistry, but since that time there has been the gradual unfolding of a substantial truth, and we must acknowledge the arrival of a new epoch in dental practice—an epoch so important and far-reaching that it has not only attracted the attention of the intelligent members of both the medical and dental professions, but the average dental office bears tangible evidence, in the ever-multiplying radiographic films and plates, that the laity is no longer ignorant of what is going on.

For the past three or four years much space in dental periodicals has been devoted to a consideration of the disease-producing possibilities of mouth bacteria, and some recently published text-books include the subject as an important factor in dental and oral pathology;—all of which is well and good.

TENDENCY TO HOBBYISM IN DENTISTRY.

While the subject is looked upon as one of paramount importance, and one that must continue to receive very careful consideration, certain influences are at work which will result disastrously unless a halt is called. The inherent weakness of the dental profession has always appeared to be hobbyism, and I am advised that some of this undesirable quality occasionally creeps into other branches of the healing art. At the present time the subject of systemic disease through mouth infection appears to have almost assumed the undesirable attitude of a dangerous fad. This expression is perhaps inelegant, and is made reluctantly; it perhaps does not sound well in a scientific meeting such as this, but it appears to be the only fitting expression to cover the present state of affairs.

While the foregoing facts are recorded as a part of the history of modern dentistry, and while in a measure they appear as blots upon its pages, it does not necessarily follow that the question of systemic infection through oral sepsis nor the regulation of diet will be recorded under the same heading; but still there is danger of this, unless some conservative action is taken. The situation now looks like the usual over-enthusiasm which too frequently follows new discoveries or improved theories of note.

The dental profession fully appreciates the gravity of the subject. It appreciates to the fullest extent the importance of the prevailing opinion that periapical infection is a possible etiological factor in many remote pathologic conditions, and that the indifferent treatment of pulpless teeth is perhaps responsible for a large percentage of such infected areas.

But until we have some satisfactory explanation as to just how these occur, it is evident that no definite progress can be made. That imperfectly filled root-canals are in some way responsible for a large percentage of these conditions is the general belief, and almost an established fact. It must also be admitted that tooth-root canals that are improperly filled, when it is possible to properly fill them, *show* poor dentistry beyond a question, and until some other reason for apical infection is found the dentist must take the blame, regardless of the fact that no small percentage of apical infections are present about the roots of teeth with perfectly filled canals.

One redeeming defensive feature, however, lies in the fact that we recognize today a preventive dentistry, just as there is a preventive medicine, and if patients do not avail themselves of this, but instead come to us, as they frequently do, with dead and putrescent pulps and alveolar infection, disease of the most dangerous kind is established before dental treatment has been begun.

Dentistry is willing to acknowledge its shortcomings in the matter under discussion, and accepts the condemnation thrust upon it from various sources as a stimulus for better operations in the future. Dentistry cannot, however, continue to be a party to the wholesale removal of teeth simply because the physician advises their extraction, and it is this rather unwise action upon the part of many physicians that provokes the dentist to the belief that we are upon the threshold of another fad for which we cannot hold ourselves wholly responsible.

The full meaning of these remarks may be best understood perhaps by the report of two or three cases which are typical of what takes place every day.

CASES ILLUSTRATING THE NEED OF CLOSER CO-OPERATION BETWEEN PHYSICIAN AND DENTIST.

A young man, age twenty-eight, showed a persistent albuminuria for the past two or three years. All other efforts to clear up the condition having failed, it was finally decided to investigate the teeth and their environments as a possible etiological factor. This, of course, was a good idea. Under the direction of the physician, and without dental consultation, radiographs of all the teeth were taken—the negatives showing two suspected abscesses about the apices of the two upper central incisors. These teeth, two of the full complement of thirty-two of as fine-looking teeth as I have ever seen, were ordered extracted by the physician. The young man being a medical student was not inclined to proceed without further investigation, and came to me for advice. Thermal and light tests gave prompt and positive proof that the pulps of both teeth were vital, which we can safely argue eliminated the possibility of apical infection. The teeth were not extracted, and it was finally acknowledged by the radiographer that the suspected areas were the anterior palatal foramina.

Another case was that of a young woman who carried out the instruction of her physician in having extracted two suspected upper molars in the belief that this would bring relief from a persistent facial neuralgia. Subsequent facts showed an impacted third molar in the ramus of the mandible to have been the real cause of irritation, as immediate relief followed its removal.

A woman, forty years of age, was advised by her physician to have seven teeth extracted, these being considered a causative factor in a constitutional disorder. The X-ray showed a periapical infection of each of these teeth. The patient visited the extracting specialist with a letter from the physician directing that these teeth be removed. This service was refused. The teeth were subsequently treated by a dentist and the constitutional symptoms gradually disappeared.

These few cases represent everyday occurrences which mean in the aggregate the daily sacrifice of a multitude of teeth —because it must be remembered that the average patient will accept the advice of the physician in preference to that of the dentist.

The remedy is simple enough; it simply means the expression by the physician of a more substantial confidence in the dentist.

Consideration should be taken of the fact that the dentistry of today is not the dentistry of a few years ago. A high standard of entrance into colleges, a four-year course of study soon to be inaugurated, the establishment and maintenance of our Research Institute of the National Dental Association, the investigation by societies, study classes, and individuals of all things pertaining to scientific dentistry—all these things, and many more of equal importance, stand out as evidence of our progressive usefulness, and as an argument that dentistry is worthy of all that it asks in the way of the support and confidence of the medical profession.

Flanders Bldg.

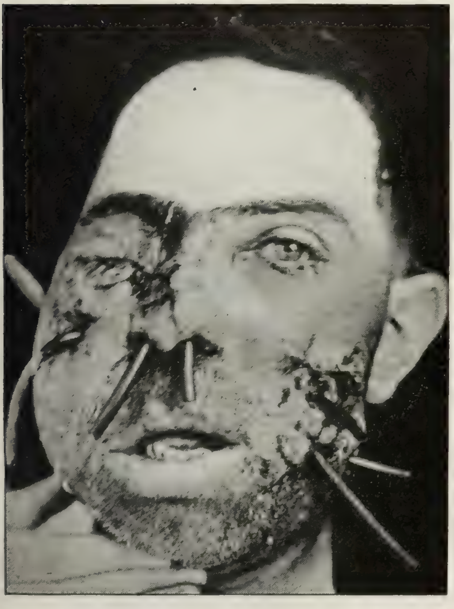
[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

A Gunshot Case Report.

By S. L. SILVERMAN, D.D.S., Atlanta, Ga.,
PROFESSOR OF LOCAL ANESTHESIA AND ASSOCIATE PROFESSOR OF ORAL SURGERY, ATLANTA-SOUTHERN DENTAL COLLEGE.

THE photographs accompanying this report are not, as might be supposed, those of a case from the front. This patient, Mr. R., had the misfortune to lose the entire upper jaw, including the palate and a portion of the vomer, as the result of a gunshot wound at close range. (See Fig. 1.)

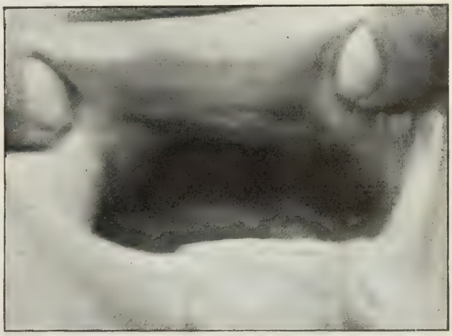
FIG. 1.



A competent physician in his home state (North Carolina) employed the Carrel-Dakin solution in the treatment of the wound, with the success usually accompanying this efficient method, and the case was then referred to me for plastic and prosthetic restoration.

Examination revealed a section of the jaw with four teeth still present, being held by fibrous bands, but with no bony structure present to wire it to, and as there was a movement of an inch in radius in all directions the section was excised. Fibrous ankylosis was present, but by sectioning the fibrous bands and exercising the lower jaw I was enabled, after a few days, to open the patient's mouth sufficiently to begin the tedious impression-taking.

FIG. 2.



Aside from the result obtained in restoring somewhat the position of the upper lip, three complications of more importance had to be surmounted.

The patient could neither drink nor eat, as the palate was lost and both antra were wide open, so that one could touch the floor of the orbit with the little finger. (See Fig. 2.) His speech was, as might be surmised, practically unintelligible.

Prior to the insertion of the appliance here shown, the patient had to assume the supine position in order to be fed by a second person, the liquid or semiliquid food being allowed to "run down" the throat. Of course, spoons, glass tubes, etc., were absolutely useless, as he had not the power of sucking the liquid into the mouth.

FIG. 3.

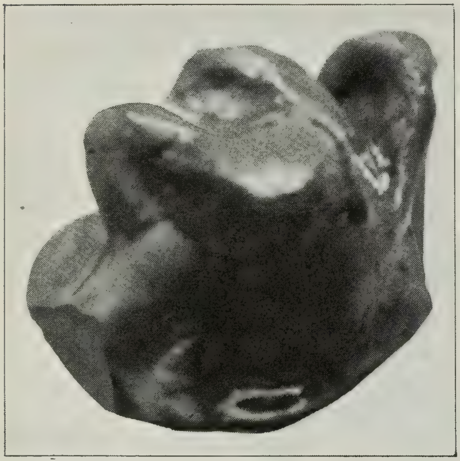


FIG. 4.

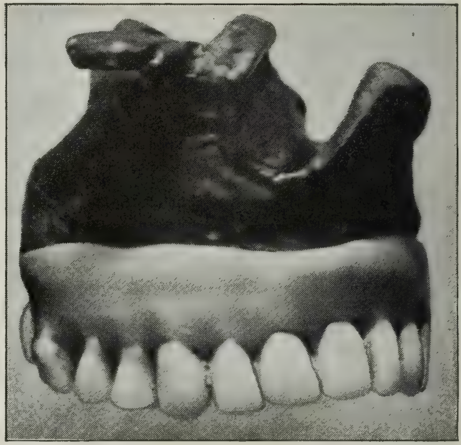


FIG. 5.

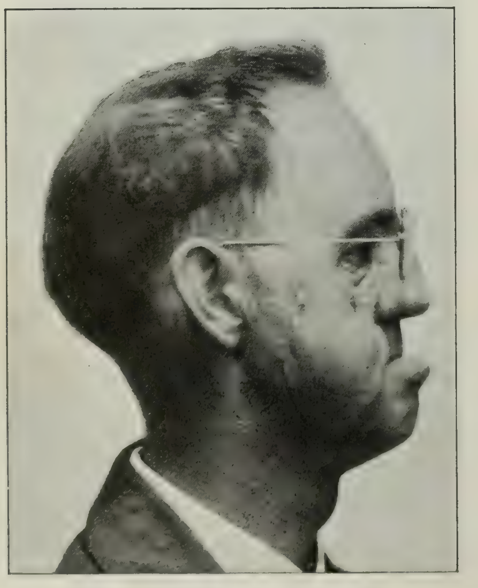
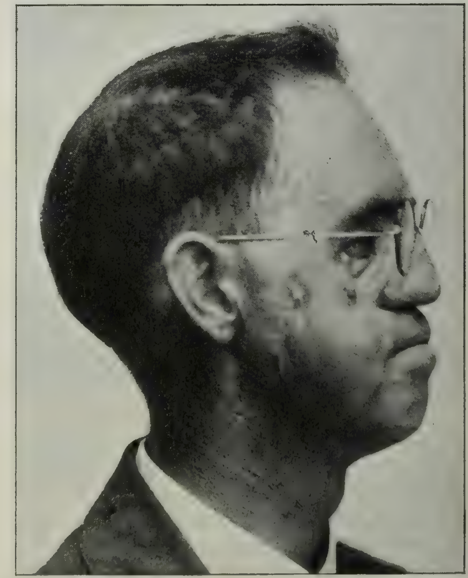


FIG. 6.



The impression technique was as follows: A piece of S. S. W. black impression compound was softened and pushed to position, no attempt being made to enter to any extent the nasal cavity or the antra. This was chilled, and henceforth it acted as an impression tray. Then piece after piece of compound was added, softening the upper additions only, until the impression, or properly speaking, the model, was complete. This compound impression or model was then invested in an ordinary flask, the compound was washed out with boiling water and the flask packed with red rubber, adding soft rubber at one or two very prominent points. When vulcanized (see Fig. 3) it was found that the addition of teeth would increase the height of the appliance to such an extent that it would then be impossible to insert it in the mouth. I therefore placed a wire along the inferior border of the obturator, and by using four Gilmore attachments produced the result shown in Fig. 4.

Fig. 5 shows a side view of the position of the lip without the appliance, and Fig. 6 shows the patient with the appliance in place.

The results are gratifying to both the patient and myself, as he can now drink comfortably and eat soft food. His speech is wonderfully improved, there being practically no defect noticeable; but, as in cleft palate patients when operated upon after infancy, "practicing to speak" will, I hope, be of help to him.

There now remains only a plastic operation on the cheek to remove an ugly cicatrix, but having incised the inner portion of the cheek considerably in releasing the adhesions, I have postponed the plastic operation until some time later. Should this appliance in time become too loose, more soft as well as hard rubber may be added.

Fourth National Bank Bldg.

Atmospheric Pressure and Muscular Tension.

By RICHARD SUMMA, D.D.S., Iowa City, Iowa.

It is commonly assumed that the muscles which draw the mandible upward into its rest position remain contracted, and thereby retain it in a state of equilibrium.

A more careful observation reveals the fact that the mandible remains suspended in its rest position by two inseparable and harmonious forces, *muscular tension and atmospheric pressure.* These forces are spoken of as inseparable because the normal function of the muscles of the cheeks and lips on the outside of the dental arches and the corresponding normal function of the muscles of the tongue and soft palate on the inside of the dental arches inevitably produce a difference of atmospheric pressure from within and from without the oral cavity.

A normal breather, when closing the mouth, swallows; this he does instinctively and involuntarily. By this act the oral cavity is emptied of all superfluous fluid and most of the air. The tip of the tongue is then pressed tightly against the lingual incisal third of the lower anterior teeth, and against the hard palate adjacent to the six upper anterior teeth. Beginning at a line drawn between the two upper first bicuspids the tongue curves downward a short distance, to rise again into contact with the anterior part of the soft palate. Thus a chamber containing thinned air—almost a vacuum—is formed not only between the upper surface of the tongue and the roof of the mouth, but also between the lower surface of the tongue and the floor of the oral cavity. At the same time partial vacua are formed between the dental arches and the cheeks and lips. The existence of these partial vacua is commonly evidenced by the smacking sound produced when opening the mouth suddenly or by pulling the cheeks outward while the mouth is closed.

To prove that suction is responsible for holding the mandible at rest, the normal breather need only drop the tongue to the floor of the oral cavity while keeping the lips in contact. In thus dropping the tongue the suction is destroyed, and the muscles now holding the mandible will tire very quickly, resulting in the involuntary opening of the mouth.

RELATION OF ATMOSPHERIC PRESSURE AND MUSCULAR TENSION TO MALOCCLUSION.

Individuals who, on account of nasal obstruction in early life, are compelled to breathe through the mouth are deprived of this atmospheric pressure and tension of the muscles of the cheeks, lips, tongue, and soft palate at a time when the teeth are seeking their places in the dental arches, and when, in fact, the erupting teeth influence the construction of the alveolar process.

If, then, we may correctly consider the inseparable forces of muscular tension and atmospheric pressure as the guides conducting erupting teeth into their final positions, what result other than malposed teeth can be expected in individuals suffering from a perversion of these beneficent forces?

Hence it may be assumed that mouth-breathing is in effect the result of asymmetrical tension of the muscles of the cheeks, lips, tongue, and soft palate, and the consequent abnormal atmospheric pressure. Mouth-breathing is by far the most frequent and potent cause of malocclusion of the teeth. With the exception of those malpositions caused by anomalies such as supernumerary teeth, transposed teeth, impacted teeth, etc., all malocclusions may be ascribed to nasal obstruction in early life.

The difference in the types of malocclusion of the teeth, all of which have been caused by perverted muscular tension and a lack of atmospheric pressure, might be attributed to—(1) The age at which abnormal breathing began; (2) the nature and extent of the nasal obstruction; (3) the constancy of mouth-breathing; and (4) the tonicity of the muscle tissue of the individual. Furthermore, it is reasonable to suspect that in early life circulatory disturbances of the naso-pharyngeal tract influence the function of the pituitary gland, which presides over skeletal development.

When identical or even similar malocclusions of the teeth are found in parent and child, it is but natural to jump to the conclusion that the perplexing and recondite factor, heredity, is responsible. This conclusion would imply that the tooth germ is predetermined to assume a malposition in the dental arch on account of the existence of such a transmissible character or tendency. In order to stamp any identical or similar malocclusion found in parent and offspring as hereditarily transmitted we should be able to establish the claim that this malocclusion, this mutilation, had been recorded in the germ plasm of the parent. Fortunately, mutilations are not transmissible.

Likewise the practitioner of dentistry is often tempted to declare identical carious destruction of tooth structure found in parent and child to be inherited. Such a declaration would imply that the micro-organisms concerned in the process of decay were transmitted, or that tooth structure specially susceptible to caries was hereditarily transmitted.

In the light of modern knowledge it seems more rational to assume that the maloccluding tooth had no more innate tendency to fall out of alignment than was the decayed tooth hereditarily endowed with micro-organisms which eventually caused its disintegration. Both are the victims of environment, perhaps of faulty metabolism.

RETENTION OF DECIDUOUS TEETH AND MALOCCLUSION.

Premature loss of deciduous teeth in normal breathers does not cause malocclusion of the permanent teeth; neither does retention of all deciduous teeth for their normal period of service prevent malocclusion of the permanent teeth in mouth-breathers. Premature loss of deciduous teeth can, at best, be considered only an aggravating factor in the causation of malocclusion.

The often-expressed opinion that early loss of deciduous molars allows or induces the first permanent molars to take positions mesial to normal should be accepted with much caution. The bicuspids, at the time when most of the deciduous teeth are lost, are sufficiently developed to prevent the first permanent molars from drifting mesially, provided normal and symmetrical muscular and atmospheric pressure are active.

The six anterior teeth of the permanent set, having a greater mesio-distal diameter than their deciduous predecessors, are necessarily crowded during their development in the bony crypts. The lateral incisors are located lingually to the centrals and cuspids. The upper cuspids are also crowded to a higher level and the lower cuspids to a lower level than the adjacent incisor and bicuspid crypts. It is only under the influence of normal muscular tension and the concomitant atmospheric pressure that the permanent anterior teeth can advance toward their final position, and thus increase the vertical and horizontal dimensions of the dental arches commensurately with the amount of tooth material.

FORCES OF OCCLUSION.

Teeth erupt, just as cells divide, we know not by what impelling force. However, we can readily observe that the path of the erupting tooth as well as its retention in its final position is controlled by certain agents, and these have been termed the "forces of occlusion."

The author of a recent text-book, entitled "Practical Orthodontia,"* enumerates—under the misleading caption, "Classification of Forces of Occlusion"—the following factors: (1) Normal cell metabolism; (2) muscular pressure; (3) force of the inclined planes; (4) normal approximal contact; (5) harmony of the size of the arches; (6) atmospheric pressure. Aside from the fact that this list is inappropriately styled a "classification," because it is merely an inconsequential arrangement of some factors, it misleads examiners who depend upon that kind of literature for inspiration into framing ambiguous questions.

The phrase, "normal cell metabolism" in this connection presents a rare chance to stagger the novice, allure the examiner, and create a feeling of reverence for the wisdom of an author. Even from the unusual explanation of cell metabolism which follows that so-called classification, one might conclude that the words "cell activity and growth," the equivalent of life, would be a clearer although a somewhat less awe-inspiring expression.

The force resulting from bringing the inclined planes of the cusps of the teeth into contact and the approximal contact of the teeth are but slightly concerned in guiding the erupting teeth. These factors are chiefly concerned in retaining the teeth in their final positions.

"Harmony in the size of the arches" is the *result* of the activities of normal forces. It is not a force *per se*, and can be construed only as one of the passive factors entering into the description of normal occlusion.

Hence there remain only the two inseparable forces of muscular and atmospheric pressure. The author states regarding his classification of the forces of occlusion—"These forces are given as near as possible in the order in which they make their appearance during the time the dental apparatus is developing." In view of this statement it is difficult to conceive why muscular pressure is given second place and atmospheric pressure the sixth place. A study of the chapter devoted to "normal atmospheric pressure" reveals the surprising fact that the author recognizes only that "pressure produced in the nasal and oral cavities during normal respiration and deglutition." For some reason or other the more important and more powerful type of atmospheric pressure described in the first part of this article is entirely ignored in that text-book of "Practical Orthodontia."

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* "Practical Orthodontia" (second edition), by Martin Dewey. The C. V. Mosby Co., St. Louis, 1916.

This failure to co-ordinate the forces of occlusion might, at least in part, account for the obvious contradictions concerning malocclusions belonging to class II, division 2. According to the statement on page 61 this class of cases is characterized by *normal breathing, normal muscular and atmospheric pressure.* On page 301 we find in another discussion of this same class of malocclusion a circuitous but nevertheless unmistakable admission that all *such patients were mouth-breathers, and naturally showed the result of abnormal muscular and atmospheric pressure.*

The critical reference to this text-book is made in order to call attention to the hardship which conflicting and vacillating statements in text-books work upon candidates for dental state board examinations. For instance, one examiner, reading page 61 of Dr. Dewey's book, will expect an answer in accordance with that text; another examiner, basing the same question on the text of page 301, is justified in demanding the contrary answer; while a third examiner, who has read the text on both pages 61 and 301, will undoubtedly hasten to engage the services of an alienist.

If such books are taken as a basis or, what is still more serious, as an authority, ordinary human compassion will cry out for help for the recent graduate as well as for the man who has not yet had sufficient personal experience to analyze basic problems, and consequently is put "at sea."

On the other hand, is the man who has learned to think for himself obliged to burden his memory with such illogical notions in order to satisfy the inquisitor? To think and to analyze is one of the main lessons which has to be taught students. It is impossible to teach constructive thinking in conjunction with such texts. Dr. Dewey's book abounds in incongruities. If recency of publication is the recommendation for the acceptance of books as a source for examination questions, let us take chances on a newer one. At the same time let it be remembered that authorship of a book and authoritativeness are not necessarily synonymous.

Relationship Between the Color of the Hair and Susceptibility to Dental Caries.

By KAN YAMAGISHI, D.D.S., Elk River, Idaho.

IN the past few years dental science has been progressing in great strides in every branch of dentistry. The dentist, however, should devote himself more assiduously to the study of dental caries, in order to ascertain the relationship of diseases of the soft tissues of the oral cavity to dental decay.

Dr. Miller's dental caries theory has been confirmed from the standpoint of operative dentistry.

Perhaps the dentist's most important duty lies in the direction of preventive measures, not only in operating on defective teeth but also in directing patients how to keep their mouths in a healthy condition.

We know that there are varying degrees of susceptibility of human teeth to dental caries. Some teeth appear to be immune to the action of the oral fluids and seldom decay, while others are very susceptible to the action of these fluids. In my practical experience I have observed a peculiar phenomenon in relation to dental caries which I consider to indicate a close relationship between the hair and the teeth.

The oriental races almost all have black hair, but white races have several different colors, *i.e.* light, black, brown, and red.

In my routine practice I have come to the conclusion that there is some relation between the color of the hair and dental caries. This conclusion is not based on laboratory investigation, but only upon clinical observation.

In patients who have light hair the teeth decay more readily than in those who have dark hair. The period of greatest susceptibility to dental decay is between the ages of eighteen and twenty-five years, and during this period dental prophylactic treatment is most essential.

The enamel of the teeth is a product of the epithelium of the oral cavity, and the hair is a modification of the epithelium of the epidermis. Histology teaches us this relation, and my own opinion, based on clinical observation, is, as already intimated, that there must be a close relation between the structure of the teeth and the color of the hair.

During the susceptible period in young patients who have comparatively light hair, their teeth oftentimes are attacked by acute soft dental caries, and in a short time after dental operations these patients return with other cavities in the same teeth. It is possible, of course, that this may have been due to imperfect operative procedures, but the occurrence of the decay at new points leads me to believe that in such patients the teeth are more easily decalcified by the oral fluids, and that the enamel is comparatively weaker than in those who have darker colored hair. We must also mention the color of teeth in individual patients, which seems to have some relation to the color of the hair.

All practitioners are familiar with the fact that certain teeth remain longer in the jaw and do not decay so easily, namely, the upper and lower cuspids. These teeth are darker and have a more yellowish tint than the other teeth.

If we place the extracted teeth of two patients of about the same age, one having light hair and the other dark, into a diluted solution of hydrochloric acid for a few days, we find that the former are more decalcified than the latter.

In conclusion, we may say that dark colored teeth, with a translucent yellowish tint, are more resistant to the oral fluids than lighter colored teeth. This distinction in the color of the teeth, however, is not noticeable in young patients, but this difference in the character of the teeth is indicated by the color of the hair. If these results of my clinical observation are confirmed by laboratory investigation, we have great opportunities for service in the utilization of selected filling materials and general treatment of such teeth, and especially in impressing upon patients with teeth which, through their color, indicate susceptibility to caries, the importance of careful prophylactic treatment.

CORRESPONDENCE

"Standardization of Dental Operative Procedures."

To the Editor of the Dental Cosmos:

Sir,—After reading the very interesting editorial in the August number of the Cosmos on "Standardization of Dental Operative Procedures," I was particularly impressed with that portion dealing with root-canal work.

Whereas I have had many cases of root-canal treatment requiring anywhere from one to eleven hours, I thought it might be of interest to you and to the readers of the Dental Cosmos to have a case reported, with pictures, in which the time consumed to accomplish perfect root-canal filling would not make it prohibitive to others than the wealthy class.

CASE OF MR. G. H.

Upper left second bicuspid, vital pulp exposed, which was removed by pressure anesthesia; root-canal treated with sulfuric acid and bicarbonate of soda, and filled with rosin and chloro-percha. (Fig. 1.) Time consumed, one hour, and one radiographic picture to prove that the work was thoroughly done.

FIG. 1.

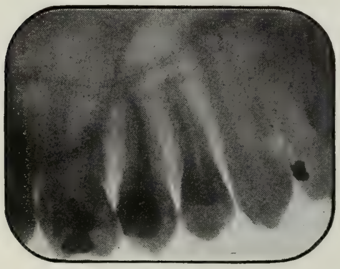
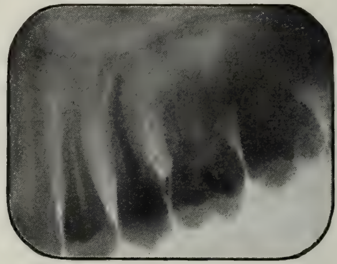


FIG. 2.



Upper right second bicuspid, removal of putrescent pulp, root-canal treated with sulfuric acid and bicarbonate of soda, and filled with rosin and chloro-percha. (Fig. 2.) Time consumed, one hour, and one radiographic picture to prove the work.

I think you will agree with me when I say that this places proper root-canal work within the means of the average person where excessive charge is not made for the service rendered.

Yours truly,

F. J. Erbe, D.D.S.

Waterbury, Conn.

DENTISTRY AND THE WAR.

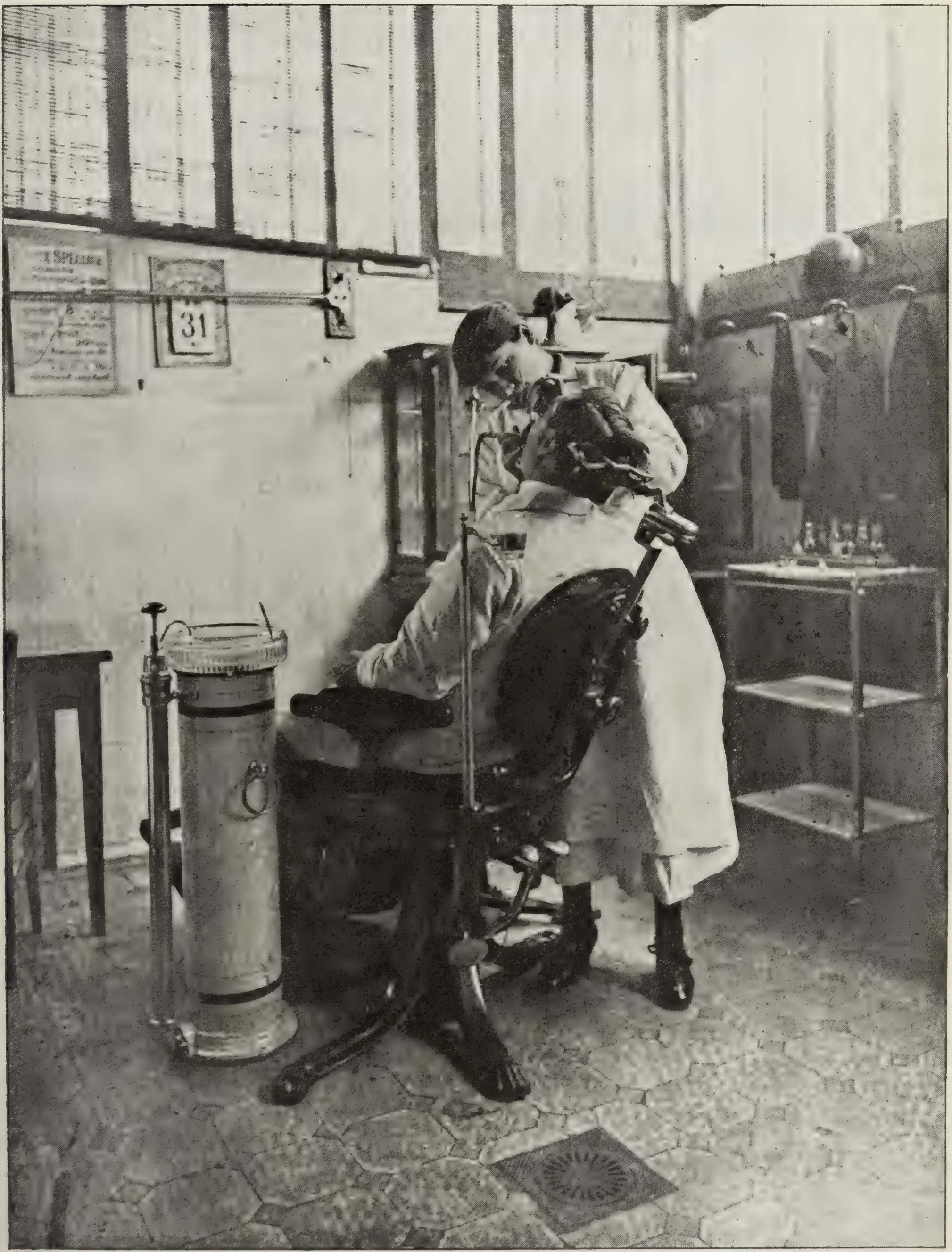


Photo by International Film Service.

A French official photograph, just received, showing a French woman dentist at work in a French munition factory.

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Susquehanna Dental Association of Pennsylvania.

Proceedings of the Fifty-fourth Annual Meeting, held at Allentown, Pa., May 22, 23, and 24, 1917.

TUESDAY—*Morning Session.*

The meeting was called to order at 10.55 by the president, Dr. Walter Richards of Slatington.

The invocation was delivered by the Rev. JOHN A. W. HAAS, D.D., LL.D., president of Muhlenberg College, Allentown.

In the absence of the mayor of Allentown, Hon. A. L. Reichenbach, who was to have delivered the address of welcome, but who had been called to Harrisburg, this address was made by Dr. HAAS.

The response to the address of welcome was made by Dr. R. M. STRATTON of Scranton.

Dr. Richards then called Dr. D. S. Gardner of Scranton, the first vice-president, to the chair while the President's Address was being delivered.

Dr. Gardner appointed Dr. V. S. Jones of Bethlehem, Dr. R. M. Stratton of Scranton, and Dr. O. H. Uhler of Allentown, as a committee to consider the recommendations contained in the President's Address.

The minutes of the previous meeting were read by the recording secretary, Dr. GEORGE C. KNOX of Scranton, and were approved as read.

It was moved by Dr. GARDNER that the DENTAL COSMOS be made the official organ of the association for the coming year, and also for the 1918 meeting. (Motion seconded and carried.)

Dr. UHLER moved that a vote of thanks be given to the recording secretary for his excellent report of the 1916 meeting. (Motion seconded and carried.)

The secretary, Dr. KNOX, read the following applications for membership: J. G. Diffenderfer, Allentown; G. H. Diffenderfer, Allentown; W. L. Williams, Bethlehem; G. F. Hummell, Allentown; B. W. Barton, Catasaqua; W. H. Shafer, Allentown; C. J. Kolinsky, Shenandoah; D. G. Knecht, Allentown, and E. D. Ulrich, South Bethlehem.

The applications were referred to the Board of Censors for action.

The secretary read a letter from Dr. E. S. Gaylord asking the society to appropriate one hundred dollars to the National Relief Fund.

The treasurer, Dr. C. A. BACHMAN of Emaus, then presented his report.

Dr. H. S. SEIP moved that the Treasurer's Report be received, and that a committee be appointed to audit the treasurer's accounts and report at a subsequent session. (Motion seconded and carried.)

The recording secretary read the resignations of Dr. H. B. Patterson of Wilkes-Barre and Dr. E. T. Wheaton of Staunton.

On motion of Dr. SEIP, duly seconded, the resignation of Dr. Patterson was accepted.

On motion of Dr. BACHMAN, the resignation of Dr. Wheaton was accepted.

Dr. STRATTON moved that a letter be sent by the secretary to Dr. Wheaton, notifying him of the acceptance of his resignation by the association with regret. (Motion seconded and carried.)

Dr. HERTLE reported that the Auditing Committee had gone over the neat and carefully kept records of the treasurer, and had found them entirely correct.

Dr. KNOX moved that the Report of the Auditing Committee be accepted and the committee discharged. (Motion was seconded and carried.)

The society then adjourned until the afternoon session.

TUESDAY—*Afternoon Session.*

The meeting was called to order by the president at 2 P.M.

The report of the Executive Committee of the previous year was read by the secretary.

Dr. KNOX then moved that the report be accepted and spread upon the minutes. (Motion seconded and carried.)

The scientific program was then taken up, and Dr. E. C. KIRK of Philadelphia presented a paper on "Malocclusion as a Problem in Pathology."

(This paper was published at page 585 of the June issue of the DENTAL COSMOS.)

DISCUSSION.

Dr. R. M. Stratton, Scranton, Pa. I was hoping that the scope of the paper might cover progressive malocclusion of middle life, a subject in which I am much interested. The essayist, however, opens up a wonderful field of thought for us. It would seem from the paper that the way to cure malocclusion, with the accompanying V-shaped arch, is to prevent the formation of the V-shaped arch by proper nutrition in infancy. This subject is not familiar to me, but the paper shows that Dr. Kirk has given a wonderful amount of time and study to it, and I should like to thank him for bringing it before us.

Dr. Henry I. Klopp, superintendent of the State Hospital, Allentown. I never like to make apologies, but I feel that I am unable to discuss the paper intelligently, not having seen a copy of it beforehand. However, it is an interesting fact that the medical and dental professions are working hand in hand, and there is no doubt that a great deal is being and has been accomplished because of this. Today, when attending medical meetings, it is not unusual to find upon the program at least one paper on the subject of orthodontia or some subject relating to dentistry.

I was very much impressed with Dr. Kirk's paper. Of course, my work during the past twenty-two years has been entirely among the mentally diseased and defective. Now, I can readily appreciate the fact that much may be accomplished during childhood in the way of overcoming certain tendencies. For example, in idiocy and imbecility, we know that a large percentage of the cases are congenital, whereas there are other types of mental deficiency in which it is due to arrest of development. It seems to me that if the general practitioner would pay attention to the condition of the mouth in early childhood, much might be accomplished in the cases of backward children, as well as in certain types of imbecility. There is no doubt that the condition of the mouth has something to do with the mental development of children. I do not believe this to be the cause in every case that shows a tendency to backwardness or evidences of imbecility; nevertheless, if we can prevent a certain precentage of cases, we are accomplishing something.

In these cases of arrested development in the defective group, we find that there is a large percentage that shows the V-shaped arch of which Dr. Kirk spoke. While we have attributed it, in a large measure, to rickets, nevertheless it would seem that progress is being made in the right direction. I have had some experience with the use of thyroid extract, and can appreciate what the doctor has said in reference to the insufficiency of the thyroid gland. While I have had no experience in this connection with children, I know that in myxedema and certain types of mental disease in which there has been this insufficiency, the feeding of thyroid has helped the patients and brought about either improvement or recovery. If this be a fact, I can readily appreciate that the use of the thyroid gland, desiccated thyroid, in these cases may be of considerable value. Nevertheless, we must not lose sight of the fact so clearly brought out in the paper, that syphilis may be an important factor, and I would add that when there is a definite history of alcoholism in one or both parents, this also should be taken into account. At the State Hospital we have been trying to progress along modern lines, and I think all state institutions today that have any regard for the welfare of their patients should, if for no other reason than a consideration of the importance of the nutrition of the patient, employ a dentist. At the State Hospital we have now in our service two dentists from Allentown, and while we are still young in the field, we feel that some progress has been made in the right direction. Through the use of the X-ray, a great deal is being learned. We have not been able to employ it in every case in the institution, yet a general survey is being made, paying most attention to those who are admitted from day to day. I should like to have you see some films that have been taken of two cases that showed this condition of malocclusion. One case was that of a boy, an imbecile of low grade, and I should like to have Dr. Diffenderfer make a statement of the findings in the case. The other patient was a woman, deaf and dumb, who showed the same condition. This I think will give you an outline of what we are endeavoring to do.

Dr. J. V. Mershon, Philadelphia. I think that the Executive Committee showed good judgment in requesting Dr. Kirk to present this paper. It is undoubtedly a valuable contribution for orthodontists, but is equally valuable to those in the general practice of dentistry. The children come to the general practitioner, and he has to make, to some extent, the original diagnosis.

While listening to Dr. Kirk's paper, the thought occurred to me as to how many men in this room were saying to themselves, "How am I going to make any practical application of the knowledge and facts that Dr. Kirk is presenting to us?" If we have one hundred men here who have treated a few cases of orthodontia, we have one hundred men who have had failures in the treatment of orthodontia. I feel that this statement is very surely correct. If you are putting in fillings in a certain way and having a certain percentage of failures, and if someone could show you the cause of these failures, you would look upon it as a very practical and valuable suggestion. Dr. Kirk has very clearly pointed out why so many failures in the treatment of orthodontia cases have occurred. The reason is this: You have been reading text-books on orthodontia, and you have been listening to papers on the subject, but the average text-book and the average paper, up to the present time, has advocated treatment with mechanical appliances only; the authors have been treating the subject from the standpoint of mechanics. It is not, however, a mechanical problem at all, but a problem of biology, and one cannot adapt a mechanical principle to a biological problem. We must first analyze the question, and understand what we mean when we use this term, malocclusion, which is incorrectly employed. What is it? What conditions have we? We have an abnormal or pathological development of the bones of the face in which the teeth are located. The teeth themselves have no power of direction; they have no sense by which they are able to occupy a correct and normal relation to one another. Why have we an abnormal development? It is not confined to the osseous tissues. It is a condition of general faulty development of the child from birth, or probably before. Will you tell me how you can cure with a purely mechanical appliance a condition that is purely pathological? You cannot; it cannot be done. The whole question, gentlemen, of orthodontia is one of retention. It is not a question of moving teeth merely; we can all move teeth. We can move teeth into normal occlusion, or what is termed normal occlusion, but we cannot keep them there. This has to be done through the process of normal growth and normal development in the child. Dr. Kirk has very extensively gone into the matter, and has sought out what the various authorities have said with regard to the etiology of these deformities. The question of retention has been looked upon in the past as a problem of osseous change, change in the bone in which the teeth are located; and it has been thought that if we moved the teeth into normal occlusion, with all contact points properly approximated, and established what Dr. Angle termed normal occlusion, they would stay there, just like the arch of a bridge. But, gentlemen, they will not do so, unless the other factors in the cause of the deformity are properly considered. Today we have Dr. Stanton trying to establish lines and arches from the standpoint of an engineer, selecting the proper amount of material and determining beforehand the particular size of the arch in which these teeth will best fit together. He may be able to do that, but he will be no nearer the solution of the problem, because, after this is done, we cannot keep teeth there. Why? You have to consider the other factors in the case, and bring these up to the same point of perfection that you have brought the arch.

I have said that the bone development to fill in the space from which the teeth have been moved is not the only factor in retaining the teeth in normal occlusion. Every cell and every organ of that child has to be changed. There are some cases of malocclusion in which no one has ever been able to retain the teeth in proper position. If you could look back in the history of the practice of orthodontia, and get complete clinical records, you would find that a large percentage of the cases with markedly abnormal development of the mandible or maxillæ have osseous deformities present in other parts of the body. The patients have been in the hands of orthopedists for the treatment of crooked spines and other deformities. One of the foremost orthopedic surgeons in this country says it is not difficult to correct a deformity of the spine or the foot from the standpoint of the osseous system; but the difficulty is to keep it corrected, and this cannot be done until you have established proper muscle tonicity. He means that the osseous system is only one thing that must be changed. Dr. Johnson of Springfield, Mass., has measured the biting force, in pounds, of over three thousand children with normal dentures, and has done the same with children who have abnormal dentures. He has also measured the strength of the hand-grip in these cases, and has found that when there is very marked abnormal development in the bones, the muscle tonicity is much less than when there is normal development. You have not only imperfect osseous development in these cases, but also imperfect muscular development. We must bring the muscular tissues up to normal before we can retain the teeth in occlusion. It is from that standpoint that many of us have had failures. We have tried only to move teeth, while we should have looked upon the matter as a purely pathological problem. I should like to cite a case in my own practice, one that Dr. Kirk knows about, in connection with the nerve reflex:

This patient, a boy, had been in bad physical and mental condition. He would stay away from school, was very unreliable, and would steal. He had an impaction of the lower first bicuspids, where the deciduous molar had been retained. The deciduous molar was removed, and within a few weeks after the correction of the trouble he became a normal youngster. He went to school and studied well. A short time after he had become normal, I started with the orthodontic work. I put on the orthodontic appliance; and because he was going away, I put on more pressure than I ordinarily would have done. The result was that he immediately relapsed into his old condition. This I think is rather conclusive evidence that in many cases we have these nerve reflexes.

Dr. Charles C. Voelker, Philadelphia, Pa. I have been in very much the same position as Dr. Kirk with regard to this subject, because I really know nothing about orthodontia, and very little about the question of the relationship between hypothyroidism and malocclusion; but it so happened that a number of years ago, in writing a paper on the subject of prophylaxis, I mentioned the influence of the pituitary body, the hypophysis cerebri, as a productive factor in the preservation of health, which is what prophylaxis really means. I suppose it is for that reason that Dr. Kirk may have whispered the chairman and asked him to invite me to discuss this paper.

We know, from Dr. Sajous' writings, that there is undoubtedly a direct relationship between the thyroid gland and the other glands of internal secretion in the production of myxedema. I look upon the whole matter, of course, from the standpoint of the operative dentist, and I was particularly interested in what Dr. Kirk had to say with regard to the experiments on rats, in which, when the thyroids were removed, the development of the teeth was arrested. Of course, with the arrest of the development in the enamel, a channel was opened for the ingress of germs. And this brings to my mind a case that I have had in practice, in which all these conditions that Dr. Kirk mentions were present:

The patient was a young man of twenty-five years, with most remarkable lack of development of the upper jaw. He had a very pointed V-shaped maxilla, and the teeth of the mandible projected entirely outside the upper arch. I think only the molars on each side were in occlusion. This patient was extremely neurotic or neurasthenic. Two of his brothers had a jaw condition very similar, but not quite so marked; and a third brother had an almost normal jaw. All, however, were neurotic in temperament. Three sisters were also of the neurasthenic type. The condition that impressed me most was that, besides the extreme malocclusion, the other pathological condition in that mouth, caries, was reversed from its usual position; instead of being on the buccal surfaces of the teeth, it was on the lingual surfaces. It was one of the most difficult cases that I have ever had to handle from the operative standpoint. It exhibited the whole series of phenomena brought out in the paper by Dr. Kirk this afternoon.

With regard to Dr. Upson's work, I would say that I have been somewhat interested in that. I have read his book, and have noticed several cases in which impactions brought about conditions of nervousness, neurasthenia, and insomnia, which seemed to disappear with the correction of the malocclusion or the extraction of the impacted teeth—usually the third molars.

Gentlemen, I think we stand at the beginning of a new epoch in dentistry; we shall have to begin to take into consideration this whole matter of the relationship of glands of internal secretion to the conditions in the mouth. We shall have to study them, and try to understand why we have these pathological conditions—why we have caries, for instance, perhaps widespread. These conditions may be due not to the conditions that exist in the environment of the mouth, but to the condition of the secretions themselves.

Dr. Kirk (closing the discussion). I was emboldened to bring this subject to your attention because I am convinced that it represents a point of view of the utmost practical importance. I do not believe that we can settle the problems of orthodontia by attacking them exclusively from the mechanical standpoint. Of course I do not mean that we should abandon our corrective mechanical treatment, but I mean that we ought to abandon the attitude of mind that makes us satisfied with our results when we have completed occlusion by mechanical procedure and then feel that we have cured the defect. We may have rearranged the teeth in correct position, but we have not cured the disorder. There is the etiological factor behind it all, and trying to get behind the obvious defect to its primary cause leads us back not only to the early developmental stage of the organism itself, but also to the nutrition of the mother. One of the most interesting things that came out in the discussion of this paper before the graduates of the Angle School of Orthodontia was, to my mind, the comment of Milo Hellman, a thinker on this line, about going back to a study of the primordial ancestral cell for a solution of this problem. In studying the cases of infants in which the arch was different from its normal form, he traced the condition to the mother's breast, and the molding effect of the nipple on the mouth of the infant—an influence that was mechanical. But that is only half the problem. We must necessarily consider this extrinsic force, but we must not fail to consider another thing, namely, what comes through that nipple, and its influence upon nutrition.

In the work of Marfan, L. Williams, and Hertoghe that I quoted, one of the points that each laid stress on was the nutrition of the infant in relation to bone deformations. The factor that probably explains the difference between the nutrition of the child fed on various proprietary foods and the child that gets its nourishment from the breast of its mother is the lack, in the former case, of that vitalizing principle, the hormone of some one of the glands of internal secretion as referred to by Dr. Voelker. We have to get back to the origin of things in these matters. There is an underlying nutritional fault in cases of this kind manifest in the very beginning of human life, and among its results is a failure of development in the maxillary and mandibular arches.

Another important thing is that the general shape of the arch is determined before the teeth come into position; and if its development is restricted and dentition proceeds, these teeth, as Dr. Mershon has explained, are brought into an area insufficiently large to receive them. It is like crowding too many staves into a barrel. You may see examples of this in the ash-barrel on a rainy day. The space that the staves are to occupy is fixed by the hoops, and when the wood is wet, the staves swell and become too large to fit in that space. Consequently, they buckle out. It is the same in principle with the attempt of the teeth to adapt themselves to an arch that is too small. That accounts for the irregularity, but besides that factor the crowding masses press on the nerve terminals in and about the teeth, and as a result there is developed a variety of reflex neuroses.

The case that I reported shows a history of intensive increasing nervous reaction; slight twitching at first, then an occasional convulsion; next the convulsions coming closer together and of higher intensity, and finally, epilepsy. I am afraid to say before medical men that a case of epilepsy may develop in that way, but all sorts of things happen. An interesting thing is that when we cure by removal of impacted teeth a case of what has been diagnosed as true Jacksonian epilepsy, we are met by the statement that it could not have been true Jacksonian epilepsy, but something else; or when we cure a case of previously diagnosed Sydenham's chorea, by relieving the impactions, we are told that it was not Sydenham's chorea, but something else; or if we remove impacted molars from a case of dementia præcox and the patient gets well, we are told that this was something different. But we have now a large record of cases, so diagnosed by experts, that have been cured by removal of these impactions that had been keeping up these slight peripheral dental irritations over a period of years. You will see, then, that the production of impaction is due, in the first place, to malnutrition, which in the course of time results in the development of an imperfectly formed arch. The teeth cannot arrange themselves properly, because of the restricted arch area; this restricted arch area, therefore, results in impaction—not impaction as we ordinarily think of it, as a tooth malposed and embedded in the jaw, but a general crowding together that has all the effect of impaction, in that it causes pressure on the nerve endings and thus sets up reflex disturbances.

If the contention of the writers already quoted is correct, we also have evidence of what is known as thyroid insufficiency in the enlarged tonsil as an expression of rickets. When I present this subject, using that term, before an audience of medical men, they say, "No; that is not rickets. The word rickets means a certain symptom complex, a certain disease." I regard it, however, as being as the French pathologist, Regnault, described it, a certain type of faulty nutritional process. In its extreme expression it presents a certain complex of symptoms with stigmata. But we may have all grades of it; in a certain grade the V-shaped arch may be a symptom; and that may be the only symptom present. It is what the French speak of as *rachitisme.* So I regard the V-shaped arch as a symptom of that disorder. I have tried to make it clear that we cannot regard these cases of malocclusion as a mechanical problem solely, but must look upon them also and fundamentally as a pathological problem.

Dr. HENRY I. KLOPP of the State Hospital, Allentown, gave a short talk on "The Relation of the State Hospital to the Community," which was discussed by Dr. E. C. Kirk, Philadelphia, and Dr. A. B. Vastine, Danville.

Dr. RICHARDS then read a telegram from Dr. L. L. Barber, president of the National Dental Association, Toledo, Ohio, conveying greetings to the Susquehanna Association.

Election of Officers.

The next order of business was the election of officers for the ensuing year, which resulted as follows:

President—Dr. D. S. Gardner, Scranton.

First Vice-president—Dr. A. E. Bull, Wilkes-Barre.

Second Vice-president—Dr. W. C. Scott, Lansford.

Recording Secretary—Dr. George C. Knox, Scranton.

Financial Secretary—Dr. George J. DeLong, Allentown.

Treasurer—Dr. C. A. Bachman, Emaus.

The society then adjourned until the evening session.

TUESDAY—*Evening Session.*

The meeting was called to order by the president at 8 P.M.

Dr. I. N. BROOMELL of Philadelphia presented a paper entitled "A Closer Relationship Between the Physician and the Dentist in the Management of Systemic Disease Through Mouth Infection an Imperative Need."

[This paper is printed in full at page 999 of the present issue of the COSMOS.]

DISCUSSION.

Dr. W. D. De Long, Reading. I appreciate very much the courtesy of being invited to discuss this paper by Dr. Broomell before this body, not that I feel as though I have anything to add of value, perhaps, but because any word that anyone may say on a topic so timely as this one that is now agitating the dental profession is of more or less value.

Dr. Broomell spoke of the fact that dentistry is not a fully recognized specialty of medicine. In a sense, it must be a specialty of medicine, recognized or not recognized, and I think that we, as dentists, have never quibbled very much about whether it is recognized or not. We are sure that it treats of medicine as the term medicine is applied. We are working on the human body, and the great feature of our work is the study of pathology and treatment of disease—and that is medicine, whether we class it as such or not.

Dr. Broomell also spoke about the

meaning of the word profession, saying it had been considered that there were three professions called the learned professions—the church, the law, and medicine—and going on to say that, in the past, only brain and not muscle was involved in the work of anyone who could lay claim to being a professional man. That idea is fast disappearing. The so-called old-school doctor is passing from the scene, and will be extinct, except perhaps in history, in the very near future. It is so also with the clergy and the law. This afternoon a legal friend of mine went into the country about fifteen miles to visit a cemetery and look up the date of the death of a person in whom his client was interested. That was hard brain-work, most of it, was it not?

Dr. Broomell referred to the fact that Miller recognized, a good many years ago, that there could be systemic infection from oral foci. It is rather a reflection on both the medical and the dental professions that this made no impression at the time, but you know that Dr. Miller spoke before his day, as a good many other men have spoken before theirs. I heard Dr. Truman say, at least twenty years ago, that a chronic abscess could never be cured, with emphasis on the "cured"; and he was almost hooted out of the building. So Dr. Miller's work was not taken seriously because neither the medical nor the dental profession was ready for it. Very few medical men at that time had the idea that rheumatism was of infectious origin. Today the tendency is, I think, to exclude the word rheumatism from medical nomenclature. Infection is the word that should be employed.

The tendency, which I think may be called a fad, of attributing almost every disease to focal infection, especially oral infection, if foci are present in the oral cavity, places the dentist in a rather peculiar position, as you all know. I do not want to dwell on that, but if we take this as seriously as it appears from many of the articles we read in our dental journals, I believe these conditions will be apt to haunt us and disturb our dreams. For instance, in from eighty to ninety-five per cent. of the teeth we are treating we will find areas of granuloma, or whatever the term may be; and they are liable, at any moment, to give rise to serious and sometimes fatal consequences, according to these articles. There is no doubt, however, that this agitation now so prevalent will have its wholesome as well as its harmful effect on the dental profession and the laity—wholesome, because it will stimulate us to do conscientious root-canal work and teach us, perhaps, not to try to save every tooth. We shall be more inclined to extract teeth than we were before this matter was brought to our minds so vividly as it has lately been.

But that is not the point of the paper. The point is, How shall these conditions be diagnosed? How shall our conduct in connection with these cases be guided?

I think that there are four parties to be considered in these cases, namely, the patient, of course, first of all; the physician, the radiographer, and the dentist, last, but not least, because when it comes to a final decision as to what remedy to apply to a certain case, the dentist's judgment ought to carry the greatest weight. Everyone during these last few years has been loaded down with patients who have been sent to him by physicians. I might also say, and perhaps be excused for saying, that a great many of these patients are sent to our offices because we have X-ray machines, and because we do quite a little extracting. It is our experience that the physician sometimes sends the patient to have a picture taken, then interprets the picture himself, and recommends extraction without consulting the family dentist. Now what is the duty of the radiographer, and what is the duty of the dentist to whom the patient is sent? I think the dentist should refuse point-blank to give any service to a patient without consulting the family dentist. I consider it a breach of professional etiquette to take a patient in that way, make the diagnosis, and give the treatment without consulting the family dentist. The family dentist, as I have said, should be the one whose judgment should be most respected. I think the picture should be interpreted by the radiographer, if he is a dentist, and I believe that no one, unless he is thoroughly acquainted with the special dental anatomy of the face and dental pathology, should be allowed to make the interpretation. There is no one who can make such a clear interpretation as the qualified dentist, if he has given the subject of roentgenology proper study and attention.

While the dental radiographer should, in my opinion, interpret the radiograph, it is not his province to advise the patient as to the treatment. This should be done after consultation between the physician and the dentist, and if they decide that the tooth or teeth should be removed they can send the patient to an exodontist for the extraction. But to take the patient out of the hands of his own dentist, I consider wrong. If the dental profession would view the question in this way, and if there were more co-operation between the physician and the dentist, I believe the work could be carried out in the best interests of all concerned.

I wish in closing to make one plea—that, after all, we do not forget that our main business is to save the masticatory apparatus of our patients. Let us try to preserve them, and if we have the intelligent co-operation of the physician, the propaganda that is now upon us will be wholesome for the profession and for our patients.

W. A. Hausman, Jr., M.D., Allentown, Pa. Those of us who have given this subject but little thought have had it brought to our attention so forcibly this evening by Dr. Broomell that we cannot fail to note its importance. He has shown his teeth in the matter, and we have found them clean, and in this paper alone has demonstrated his right to the degree of D.D.S.—not Doctor of Dental Surgery, but Doctor, Dentist, and Surgeon closely combined. He has urged the need of this closer relationship in the proper management of systemic disease to all of us—physician, dentist, and surgeon alike.

I agree with him that it is the minority who fail to see the need of co-operation; but too often the majority, though they see the need, yet fail to consummate such co-operation for the benefit of their patients.

The subject is a fad only to those who are superficial, and consequently to such as fail to look beyond the narrow confines of their own particular branch of the healing art. But such as are awake and growing in the profession as a whole are co-operating, and will check effectually the ever-present tendency to faddism by more careful and scientific work. So complex have our specialties become that we must get together and weigh the combined evidence, if we would come to intelligent conclusions.

On this subject of mouth infections I shall confine myself to a few remarks from the surgical viewpoint, assuring you that my colleague, Dr. Kline, will care for the medical end more particularly. What the factors are which determine the localization of bacteria, after they gain access into the circulation, is obscure, but that it does occur is well established; and furthermore, if only the place can be discovered and eradicated or properly dealt with, the first and most important step in the treatment will have been accomplished.

The infectious material producing the greater number of diseases, both medical and surgical, enters the system through the mouth, and, as a source of focal infection the mouth is not looked upon alone as a place of entrance of bacteria, but a place where conditions are favorable for them to develop and to acquire properties which give them a wide range of affinity for various tissues and organs of the body.

This brings us to that remarkable chain of evidence, microscopic, bacteriologic, and clinical, produced by the work of Edward C. Rosenow of the Mayo Foundation, whose brilliant researches in the transmutation of bacteria entitle him to the foremost place in showing the clinical connection between focal infection and systemic disease. Take, for example, the surgical affections, appendicitis, cholecystitis, and ulcer of the stomach, alone, that triumvirate of abdominal infections;

Rosenow has shown that these infections have a strain of streptococci which reproduce the same disease in animals into which the strain is injected, and he has also produced the same lesions in the appendix, the gall-bladder, and the stomach when these strains were taken from the apparent origin of the infection in the mouth. In many cases the infectious pocket was found to harbor streptococci having elective affinity, and it is interesting to note that the strain of streptococci in appendicitis, gall-bladder disease, and ulcer of the stomach resemble each other very closely in cultural and other respects, and that their virulence seems to be a factor in determining their place of survival after intravenous injection.

You will note that all the evidence goes to show that the infection does not result from swallowing the infectious material, but always by absorption through the blood current. Dr. Rosenow has already piled up evidence, experimental, clinical, and a combination of the two, and is still at work upon this subject, which marks an epoch in our allied professions. In the light of this wonderful work we are able to understand the causation of many diseases which heretofore baffled explanation.

In one case of recurring ulcer of the stomach following an abscess at the root of a tooth, the streptococcus from the pus from the sinus showed an affinity for the stomach so marked that it produced ulcer, not only after intravenous but also after intraperitoneal and intrapleural injections. Again, in a case of an acute ulcer following an attack of grippe, cultures from the infected area about the lower left third molar tooth produced a hemorrhagic ulcer in the stomach of two rabbits, both of which were apparently well at the time they were chloroformed, seventy-two hours after injection. Even the localization of these experimental ulcers corresponds strikingly to the location of the ulcer in man at autopsy and on the operating table.

The occurrence of acute ulcer of the stomach and the exacerbations of the symptoms in chronic ulcer in connection with foci of infection, the improvement in symptoms following removal of foci of infection, and the development of new ulcers after excision of ulcers in patients in whom chronic suppurative foci have not been removed, all strongly suggest the etiological relation between remote foci of infection and ulcer. Evidence is not lacking that appendicitis and gall-bladder disease have a similar relationship to foci of infection. Since the bacteria that grow in a given tissue acquire greater affinity for that tissue, the likelihood of these bacteria to infect secondarily is relatively slight; hence the secondary focus, a cholecystitis, for example, would appear to be less important as a distributer of bacteria than the primary focus. If, however, the secondary focus happens to be in a joint, it may play an important rôle in causing extension to uninvolved joints, and in preventing recovery.

The clinical evidence and the results of experimental research are piling up from dentist, physician, and surgeon, independently and working together in groups, and it is inevitable that erroneous conclusions are sometimes deduced, with unfortunate results, as Dr. Broomell has cited. But we are working in the right direction, and by a proper confidence in the scientific integrity of each other a closer relationship will result from day to day that will redound to the benefit of our clientage and to ourselves.

Dr. W. D. Kline, Allentown. "He who diagnoses well, cures well." That is an axiom of medicine which I suppose holds good in dentistry. Now the question is how to arrive at the diagnosis. Dr. Broomell spoke of the old-time physician and the methods at his command in arriving at a diagnosis. The modern physician proceeds in another way. He does not listen to an organ recital and try to put on the soft pedal, but actually studies his patients. The case is not treated simply by the use of drugs, but the patient is studied, and his condition managed. Each detail in his life and habits is carefully taken into consideration, and everything about him examined; and then the evidence is weighed, and some kind of conclusion is reached. For instance, you get a man in the office with a systemic condition, and some evidence of focal infection, wherever it may be, that might produce a disease process. We study the patient by the systematic or routine manner, and sometimes discover many things that we did not suspect. That is the difference between the old-time doctors and the physicians of today. The latter have a systematic standard by which they examine patients, beginning at the head and going down the body, finding out everything possible. If they find any conditions that are obscure, they send the patient to the ophthalmologist, the otologist, or the rhinologist, and have him examined to see whether there is anything amiss in any of these fields. He is sent to the stomach specialist—and, of course, to the radiographer, and his excretions and secretions are sent to the laboratory for examination; so, now, why should we not also send the patient to a dentist? It seems as if a dental examination should be made in many obscure cases. It is as important a procedure in studying the patient as is the report from the nose-and-throat man or the eye man, or any other specialist. Therefore, in every well-conducted hospital there should be a dentist on the staff. Why should we not have the services of a dentist to give us the benefit of his experience, and especially to interpret radiographic plates of the mouth and teeth? There is no man who is competent to interpret another man's plates; the man himself, who knows all the difficulties that arose when he made it, is the only man who can interpret the plate. It is certain that dentistry is a part of medicine, and the two must go hand in hand.

Now, how shall we get together? It is difficult to get physicians together, so how shall we get physicians and dentists together? Doctors are very jealous of one another, and some men, when they get an obscure case, will hold on to it, and will not send it to some other man for further study. In a medical school you get a smattering of everything. I was even taught to "pull" teeth. In that way the difficulty is increased, but it can be done by educating the laity. The success of the antituberculosis campaign and of the campaign against cancer is due to the education of the laity, and all other campaigns are successful only when the laity are educated. The people are now trained to demand an examination. You have trained people to come to you and have their teeth examined; this is preventive dentistry. It is preventive medicine which is the future medicine; the old-time doctor is going to pass away. To prevent disease we must have the legislature on our side to pass laws so that we may bring to task the doctor who does not come up to the standard; and we must educate the people so that they will realize his deficiency. The people are carefully studying the problem and are asking questions; and while it is true that a little knowledge is a dangerous thing, and you cannot teach people to diagnose their own condition or treat themselves, yet they are able to judge when the proper steps have been taken to ascertain their condition and the results are good in the end.

A number of years ago it was thought that every disease of the human race was due to an infected appendix. We have a lot of fads in medicine. We have the food faddists, and all other kinds of fads are coming up continually; yet fads are good things, because they make a man think, and all have a certain amount of truth in them. There is no doubt that there are, in certain cases, tooth infections that cause trouble, and that if these are diagnosed and eradicated the cases will be cured.

What we want is to get together and instruct people, by means of lectures, etc., showing them what is meant by preventive dentistry and preventive medicine. When we get the people trained to come to the dentist and to the physician every six months to have a thorough examination, then we shall have the relationship between the two professions established on a proper basis.

Dr. Broomell (closing the discussion). I want it fully understood that I have no desire to belittle or depreciate the question of the possibility of systemic infection through dental disease. That is a fact beyond dispute. The most important feature, which I hoped would be considered in the discussion, has practically not been considered at all, although it has been touched upon. I recognize the fact that, as the last speaker said, it is difficult for us to know just how to get together on the subject under discussion. If physicians cannot come to an understanding, it is of course more difficult for the physician and the dentist to do so.

I wish to take exception to what Dr. De Long has said regarding the function of the radiographer. If I understood Dr. De Long correctly, he believes that the radiographer should interpret the plate or film. It seems to me, however, that it is the place of the dentist to do this. If we do not have an X-ray machine in our own office, we ought to treat the subject as though we had, and be masters of the situation. I have been much annoyed lately by having found a change of views taking place in the man who is doing my X-ray work. It was his former custom to turn over the X-ray plate to me without comment, but during the past six months he has not only been commenting upon them, but telling the patient what he thought, which I believe to be absolutely wrong. If this must be done, it should not be done before consulting with the dentist. The dentist knows the dental anatomy and the surroundings of the teeth, and has a better groundwork for interpretation than has the X-ray specialist, who does this work in a general way.

In regard to the question of the physician sending the patient to the dentist I would say, That is just what we want him to do. I do not object to that for a moment. My only objection is when the physicians do not send the patients to us. Many cases occur in which the patient is directed to have his teeth extracted without consulting the dentist; that is what I took exception to particularly. If patients are sent to the dentist by the physician, that is exactly what the dentist wants.

The education of the people can certainly best be brought about through the laity. The more we dwell on that feature the better off we shall be.

There is another point that I believe has puzzled many of us in the correct interpretation of an X-ray picture, and that is, to distinguish between a pathological area and one that is cured or partly cured—cicatricial tissue, we may call it. I do not believe there is any definite way of distinguishing between the two, and we may therefore treat a periapical infection and have it cured, while yet the film shows the same periapical density as before.

The President then introduced Dr. F. A. Peeso, New York City, who gave an illustrated lecture on "Removable Bridge Work."

The society then adjourned until Wednesday afternoon at 2.30.

(To be continued.)

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

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PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, OCTOBER 1917.

EDITORIAL DEPARTMENT

Exemption of Dental Students from Military Service.

DENTISTRY in its evolution from a mechanic art to the status of a professional calling has had to continually meet and overcome the obstacles to its progress interposed by the prejudiced and the uninformed. When the ignorance or prejudice of the lay public materializes as a concrete proposition in the way of dental progress its removal is generally a more or less simple question of popular education, but when it is the expression of a high official clothed with powers which confer almost autocratic authority the case takes on a decidedly serious aspect. The Hon. Secretary of War is quoted as stating to a committee of deans representing the dental colleges of the United States that ''The army could, if necessary, get along without dentists.'' As an unqualified statement of a bald possibility the assertion is doubtless true. The civil war was fought out to a successful conclusion without a dental corps, and Pliny asserts that Rome got along for 600 years without physicians. Yet the loss of life from disease and privation during the civil war exceeded the destruction of life from casualties sustained in conflict, and the forces of the North alone suffered more loss from disease and privation than did the British forces from gunshot wounds during the whole Crimean war. Nevertheless, in both instances they "got along." So also Rome was from time to time devastated by plague and other disease, but it also "got along" and earned for itself the soubriquet of the Eternal City.

In times past we "got along" without rapid-fire guns, submarines, torpedos, internal combustion motors, wireless telegraphy, airplanes, tanks, gas bombs, and various other modern conveniences now regarded as indispensable to the conduct of warfare. We "got along" without a knowledge of bacteriology, antiseptic treatment of wounds, and military sanitation; we not only "got along," but we blundered through to success as measured by then existing standards;—but at what cost of time, money, and life? Doubtless we could get along with a Secretary of War apparently lacking in appreciation of the importance of dental service to the health of those enlisted in the military forces of the nation! But the present situation is not a question of getting along; it is essentially a question of "getting there" with the least cost in man power and money, and in the shortest possible time.

The Government of the United States created and established by law a Dental Surgeons Corps as an integral department of army and navy medical services before the present administration was called to take charge of the national welfare. It is therefore no longer a debatable question as to whether we could get along without dentists or not. The National Congress has provided that we shall not have to get along with our military forces uncared-for in that particular. The real question at issue is whether a narrow-minded policy of literalism in the administration of the Selective Conscription Act shall be permitted to nullify the practical working out of the provisions already established for securing an adequate dental service for those engaged in the national defense.

The statistics presented in the report of the Committee of Deans of Dental Colleges (see following page) clearly show that unless the present undergraduate classes in our dental schools are exempted until graduation, the supply of dentists will be wholly inadequate both for military requirements and for civilian needs.

The situation is a serious one. It has arisen wholly from the failure of the Secretary of War to grasp its importance both to the army and the public—a failure apparently due to lack of appreciation and understanding of what dental service means as a safeguard to the efficiency of the service, and therefore in its degree as a factor in the winning of the war.

A campaign with regard to the importance of army dental service directed to the education of the Secretary of War would seem to be in order under present circumstances, and the dental profession should promptly exert itself in bringing the pressure of its influence to bear thereon as quickly and as forcefully as possible.

Attention is called to the announcement by the Surgeon-general of the U. S. Army, as printed in another part of our present issue, of the examinations to be held next month to fill the (one hundred) vacancies in the Army Dental Surgeons Corps.

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Why Drafted Dental Students Should be Permitted to Finish Their Courses.

CERTAIN DATA WHICH HAVE BEEN GATHERED FOR THE INFORMATION OF THOSE INTERESTED IN THE MAINTENANCE OF AMPLE DENTAL SERVICE FOR THE UNITED STATES ARMY.

On Friday, September 7th, the Hon. Newton D. Baker, Secretary of War, in declining to recommend that an order be issued giving drafted dental students temporary exemption until graduation, said to the members of the committee representing the deans of the dental colleges of the United States, that the army could, if necessary, get along without dentists. The Provost-marshal, General Crowder, wrote to the Secretary of War on June 30th:

> I think that any medical student drafted can continue his studies to the very best advantage in the medical corps of the United States Army, and gain a practical experience which he could not gain at any other time than war. It would be very well, it seems to me, if all the medical students could be furloughed from the colleges into the army for the purpose of taking this practical training, rather than furloughing them from the army back to the medical schools to complete a technical course.

As it is the duty of the Secretary of War and General Crowder to weigh the relative value of each student in the line service as compared with his value later on in the medical service, and as they undoubtedly wish to do what is best for the army, we can only conclude from their statements that they need to be more fully informed as to the medical and dental needs of the army.

A few weeks after the United States joined the Allies in the war against Germany it was announced on seemingly good authority in Washington that it was the desire of the Surgeon-general's office and the War department that *all medical and dental students should continue their studies, and that they certainly would not be called into service until after graduation.* It was apparently appreciated that there would be an ever-increasing demand for more and more physicians and dentists, and as no one could foretell the duration of the war, it seemed that the production of physicians and dentists should not be reduced. The United States was to profit by the example of England, France, and Canada, and would not make the mistake of sending partly trained medical men to the front in the line service. The announcement became common knowledge throughout the country, and such sensible action was generally accepted as right.

It was not until after the registration for the draft that the War department apparently became frightened over the problem of class exemptions, and announced that no exemptions would be made except those provided by law. Pressure was immediately brought by the medical profession, and after weeks of argument an order was issued by General Crowder on August 29, 1917, that hospital internes, and fourth-, third-, and second-year medical students who were called into service might enlist in the enlisted reserve corps ("Regulations for the Enlisted Reserve Corps," Act of June 3, 1916) and be permitted to complete their course.

It was generally presumed that the dental service was considered a valuable and necessary part of the medical service of the army, and that dental students would be included in such an order. It was therefore a surprise to both physicians and dentists throughout the country that dental students were omitted.

While practically every argument which has been presented favoring the temporary exemption of medical students applies to dental students as well, the following information has been gathered by the Committee of Deans of the Dental Colleges of the United States for those who may be interested, as applying more especially to dental students.

No Legal Obstacle to Issuance of Dental Order.

There is no legal obstacle to the issuance of an order for dental students similar to that issued for medical students. The regulation specifies that "Engineer, Signal, and Quartermasters corps and the Ordnance and Medical departments of the regular army" may have such enlisted reserve corps. As the army dental service is one of the medical departments, it might be included in such an order. *Attention is called to the fact that the issuance of such an order would not "let down the bars" to an endless line of similar orders, as the regulations referred to apply to but the three corps and two departments above mentioned.*

Effect of Draft on Dental Students.

At the request of this committee the deans of a majority of the dental schools throughout the country sent blanks to all underclassmen of last year to be filled in and returned direct to the chairman of this committee. Each dean was also requested to report the number of those in attendance in each class last year and to give best estimate of the number who will matriculate in the freshman class this fall.

From the blanks returned the following table has been prepared:

Total number of underclassmen in dental schools last year	7624
Number to whom blanks were mailed	6510
Number of blanks returned to date	4414
Number not of draft age, or alien	1248
Number in draft	3170
In first call	756
Accepted	556
Rejected	200
Percentage of all students called in first draft	17.1
Percentage of students of draft age who were called in first draft	24
Percentage of all students accepted in first call	12.6
Percentage of drafted students accepted in first call	17.2
Percentage of all students who have volunteered in the army or navy	5.0
Number of students of last year who will be accepted through the draft at above percentage rate	960
Number of students of last year who have volunteered	381
Total number entering army through first draft or as volunteers	1341
Total freshmen matriculated in all schools last year	4184
Estimate of freshmen this year	1330

From the above it will be noticed that a total of 1341 students have already been taken from the classes which will graduate in 1918 and 1919. In accordance with the blanks returned, a few more will be included in the second call than the first. Allowing for errors in the calculations of some students, it is safe to estimate that the second call will include as many as the first. Several schools report having already received many letters from this group stating that they will not return, as they do not wish to go to the expense in time and money with the chances so greatly against their being permitted to complete another year's work. Even presuming that the next draft does not come until late next spring (so that those who do attend might receive credit for the year's work), it seems a fair estimate that at least 5 per cent., in addition to those drafted and volunteered, of the graduating class of 1918 will not return this fall because of the second call, and that the full 12.6 per cent. for the second call may properly be deducted from the class of 1919, as they will not reach graduation. It is to be presumed that at least a third draft will also be made before this class graduates, making a similar further reduction. We must also deduct an additional 10 per cent. from the class of 1918, and at least 15 per cent. from the class of 1919, to cover the normal loss in these classes from many causes—sickness, faculty action, financial difficulties, etc.

On these calculations, the effect of the draft will be to take in the neighborhood of 1121 students from the class of 1918, and 2417 students from the class of 1919.

Owing to the fact that all dental schools have extended their courses from three to four years beginning this fall, there will be no graduating classes in 1920.

It will be noted that the class of 1921 (freshman class of this fall) will be about one-third of last year's class, this reduction being undoubtedly due in large measure to the draft.

Supply of Dental Students already Less than Demand.

On account of the development of the important relationship of mouth infections to general health, and the education of our people to the value of healthy mouths, the demand for dental service has increased much faster in recent years than the supply of dentists. Therefore, under the most favorable conditions it would be impossible for the dental schools of the country to turn out during the next five years as many dentists as will be needed. If the army takes all it needs, the civilian population must suffer. It therefore seems almost imperative that the greatest possible number of dentists should be graduated.

The number of graduates from all of the dental schools of the United States for the past five years was as follows:

1913	2022
1914	2254
1915	2388
1916	2835
1917	2989
Total	12,488

This is an average of 2497 per year.

The best estimate that can now be made for the next five years is as follows:

1918	2319
1919	1767
1920	*practically none*
1921	1000
1922	800
Total	5886

This is an average of 1177 per year.

It is thus apparent that the effect of the draft will be to reduce the number of graduates for the next five years to about one-half the number graduated during the past five years, and it will necessarily be four years after the close of the war before the graduating classes will begin to increase again in numbers.

Attention is called to the following affidavit stating the effect of three years of war on the dental service of Canada:

> I, A. E. Webster, M.D., D.D.S., L.D.S., dean of the Royal College of Dental Surgeons of Ontario, of the city of Toronto, in the county of York, do solemnly declare that—
>
> 1. Three years of war under the voluntary system of recruiting has reduced the number of dentists in practice in Canada by one-fifth. The dental colleges with all possible effort have not been able to supply the demands of civil practice. Dental assistants for the army are supplied from the physically fit dental students, while the unfit graduate to supply the places of those who have left civil practice to join the army.
>
> 2. Dentistry is an admitted necessity, especially in the army.
>
> 3. It is my opinion based upon experience that a larger than normal supply of dental students should be admitted to the dental colleges to supply dental assistants for the army and graduates to take the places in civil practice of experienced dentists who take up military practice. And I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath, and by virtue of "The Canada Evidence Act."
>
> A. E. Webster, M.D., D.D.S., L.D.S.
>
> Declared before me at the City of Toronto, in the County of York, this 31st day of July, A.D. 1917.
>
> E. T. Coatsworth,
>
> [SEAL] *A Notary Public in and for the Province of Ontario.*

Present Ratio of Army Dentists Inadequate.

The following is quoted from an editorial in the September Dental Cosmos:

> The Government has provided for a corps of army and navy dental surgeons in the ratio of one dental surgeon to every one thousand enlisted men. Carefully computed statistical data tend to show that the average available working time of a dentist is about two thousand hours per year, upon the basis of which it appears that the Government has made provision for an average of one hour of dental service every six months for each enlisted man—an amount of time wholly inadequate for the work required to be done. Any dentist who is giving full and efficient service to five hundred patients per year is in full practice. No dentist can give proper service in accordance with modern standards of practice to one thousand patients per year. To attempt to serve that number under army conditions tends to lower the standard of the service itself and is demoralizing to those who are engaged therein.

Every dentist who has studied this problem knows that there should be at least one dentist for each 500 men in the army; just double the present number of dentists. A bill is now being prepared for presentation in Congress which provides for this increase. Obviously there should be foresight to have ready not only the 1 to 1000 now provided for, but also the more adequate service which will very likely be provided for by law.

Dental Profession has Shown Fine Patriotism.

In spite of the fact that the Washington authorities have shown little tendency to recognize the value of the services of the dental profession, its members have exhibited as fine a spirit of patriotism as any class of citizens possibly could. Realizing the very bad condition of the mouths of many conscripts and the inadequacy of the government service, the dental schools throughout the country have thrown open wide the doors of their clinic rooms, and have, without charge to men or Government, cared for the mouths of both conscripts and those who were refused enlistment on account of the condition of their teeth. There has also been organized the Preparedness League of American Dentists, consisting of thousands of dentists throughout the country, and these men have, in private offices and elsewhere, given their services to the army men. *By this gratuitous service the dental profession has made possible the enlistment of several times the number of men (who would otherwise have been rejected) that will be called from the dental schools by the draft.*

It should also be mentioned that large numbers of dental students offered to enlist in the various base hospital units and other branches of army and navy service, and they were almost universally advised that they would render the most patriotic service by remaining in school. Many were thus deprived of entering officers training camps and branches of service for which they had some special qualification.

General Crowder on the Value of Dental Service.

General Crowder recently wrote to the governors of five Eastern States a very strong letter in which he emphasized the great need of dental service in the army, and the inadequacy of the present service of one dentist to one thousand enlisted men. He urged that measures be carried out to put the mouths of conscripts in the best possible condition before they were sent to the various camps. This letter was written to ask for the co-operation of the governors and local boards to the end that the conscripts might be promptly notified to report for mouth examinations.

Dentistry a Branch of Medicine.

It would seem almost unnecessary to call attention to the fact that dentistry is a very integral part of medicine. Dentistry has been taught in separate schools because the technical procedures require special teaching and clinical facilities. The courses in dentistry have gradually included more and more of the fundamental branches of medicine, until today the medical school courses in anatomy, histology, physiology, chemistry, general pathology, bacteriology, etc., are very closely duplicated in dental schools. The entrance requirements for dental schools have been raised to graduation from a four-year high school accredited to the state university, and the dental course has been lengthened to four years.

The developments in recent years of the rôle that mouth infections play in relation to general health have served to connect dental and medical service in the most intimate way. A review of the medical journals of the past five years will reveal more references to mouth infections as the cause of various disabilities than any other single source. When attention is called to the large percentage of cases of rheumatism, nephritis, appendicitis, inflammation of eyes, of heart muscles, etc., as a result of chronic mouth infections, it is appreciated that thousands of men have been exempted from the draft because of mouth infections, and thousands more who are accepted will doubtless be incapacitated from lack of adequate dental service. Couple this with the reports from Europe that the face and head wounds, which constitute 20 per cent. of injuries, are frequently seriously complicated because of abscessed teeth, and we have a glimpse of the relationship of dentistry and medicine. Careful investigations by radiographic examination show that more than 50 per cent. of persons of draft age have chronic suppurating foci in the jaw-bones. Add to this the thousands of cases of "trench mouth" in which the gums are so swollen and painful that food cannot be chewed—a condition requiring the most careful dental service; also the many cases of fractured jaws, which the trained dentist is peculiarly well qualified to treat. Will anyone say that, in army service, the nose-and-throat specialist, the eye-and-ear specialist, or any other of the specialists, is more important than the dentist?

In conclusion, attention is called to the fact that the members of the class of 1918 will be able to finish their dental training and be ready to enter the army dental service at as early a date as their training could be completed for line service, and the class of 1919 could be made ready for graduation by January 1st of that year. All dental schools will modify their courses to give special training for army service, so that the graduates of next year will be in some ways better qualified than dentists who have been in regular practice for some years.

In presenting this statement, it hardly seems necessary that we should pledge the fullest possible degree of loyalty of the dental profession and its schools to the Government. We believe it our highest duty to see to it, if we can, that the dental needs of the army and of the civilian population be cared for in the best manner possible. This is our aim.

All of which is respectfully submitted.

COMMITTEE OF DEANS:

HENRY W. MORGAN, Nashville, Tenn.
H. E. FRIESELL, Pittsburgh, Pa.
W. H. G. LOGAN, Chicago, Ill.
F. D. CASTO, Cleveland, Ohio.
ARTHUR D. BLACK, *Chairman*, Chicago, Ill.

AFFIDAVIT BY DR. BLACK.

To whom it may concern:

I, Arthur D. Black, Jr., Dean of the Northwestern University Dental School, Chicago, acting as chairman of a Committee appointed by the Deans of the Dental Colleges of the United States, hereby state that I have received the following reports from the persons named, and that I believe there is no reason to question their accuracy:

I. From Dean Guy S. Millberry, of the Dental Department of the University of California, San Francisco: That the California District has exempted medical and dental students and teachers.

II. From Dean Wallace Wood, Jr., of the Tulane College of Dentistry, New Orleans, La.: That the District Board of New Orleans has granted temporary exemption of senior dental students until the completion of their dental course.

III. From Dean J. H. Kennerly, of Washington University Dental School, St. Louis: That the St. Louis District Board has decided to exempt senior dental students.

IV. From Wm. Rice, Dean of Tufts College Dental School, Boston: That several of the students of Tufts College Dental School have been given leave of absence for a period sufficient to cover their studentship in the school. Dr. Rice inclosed with his letter a copy of order of District Enrolling Officer in the specifications in the case of Ralph H. McNary, seaman, U. S. N. R. F. This is signed by G. C. Mitchell, Commander, U. S. N.

Arthur D. Black, Jr.,
Northwestern University Dental School.

Chicago, Ill.: Subscribed and sworn to before me
this 27th day of August 1917.

[seal] Julia Whollehen, *Notary Public.*

A Correction.—In our issue for August, in the article by Dr. H. Ausubel (see p. 807, last line), *for* "a girl patient of nine years" *read* "of *nineteen* years."

BIBLIOGRAPHICAL

DENTAL MATERIA MEDICA AND THERAPEUTICS, WITH SPECIAL REFERENCE TO THE RATIONAL APPLICATION OF REMEDIAL MEASURES TO DENTAL DISEASES. A Text-book for Students and Practitioners. By HERMANN PRINZ, A.M., D.D.S., M.D., Professor of Materia Medica and Therapeutics, The Thomas W. Evans Museum and Dental Institute School of Dentistry University of Pennsylvania; formerly Professor of Materia Medica, Therapeutics, and Pathology, and Director of the Research Laboratory, Washington University Dental School, St. Louis. Fourth Edition, revised and enlarged according to the U. S. Pharmacopeia, 9th decennial revision. Price, cloth, $5.00. St. Louis: C. V. Mosby Co., 1917.

The fifth edition of this popular book has been thoroughly revised and enlarged to include the consideration of many new drugs which have come into use in dentistry since the previous editions. Numerous important changes relative to average doses of drugs, and also the addition of a number of valuable drugs of interest to dentistry, as suggested for the first time in the new U. S. Pharmacopeia, have been duly considered in the new edition.

It is extremely difficult, even undesirable, to draw a definite line of demarcation between dental and general remedies, and the author has wisely refrained from attempting to draw such a line. He has, however, eliminated from consideration in the present edition all drugs for which the dentist has virtually no need in his practice; while, on the other hand, the desirability of including in his treatise many new drugs which have been called into dental use in the past few years has formed an impelling motive, together with the increasing demand for his excellent book, for the author to issue this revised and enlarged edition.

The author's pre-eminent position as an authority on Ionic Medication is well recognized; the article on Electro-sterilization has been completely rewritten, and some twenty new illustrations added, so as to make it particularly instructive and valuable to the dental practitioner, in that it describes the technique of ionization in such a clear and concise manner as to remove much of the uncertainty accompanying the procedure, and places the process of ionization of dental tissues on a thoroughly accurate and scientific basis.

The chapter on Local Anesthesia deals extensively with the method of producing novocain "conduction" anesthesia as introduced by Braun and Fischer, and should be studied carefully by every dentist who practices conduction anesthesia. Dr. Prinz is an eminent authority on this very popular method, being one of the pioneers in its use, and having been largely instrumental in its adoption for dental operations so generally in this country.

The author condemns in no uncertain terms the present prevalent use of formaldehyd in the form known as Buckley's paste as a desensitizing agent, claiming that it is entirely too dangerous a drug for such purpose, its caustic action being so intense that some dental practitioners have been led to use it not as a desensitizing agent, but for the direct purpose of devitalizing the pulp. It is to be noted, however, that no reference is found either in the contents or in the index to Formaldehyd as a Desensitizing Agent. It is regrettable that the index should thus be defective in this respect, as it detracts in a degree from the value of the book as a ready reference work.

Dr. Prinz's effort to present the important matters with which he deals in a concise and comprehensive manner, and in a style which directly appeals to the student and practitioner, has been notably successful, and has given his book a conspicuous and permanent place in dental literature, as evidenced by the fact that it has been adopted as the standard text-book on this subject by almost all of our dental schools, as well as by the United States Government for the army dental corps.

The book is well up to the present-day standard of dental text-books, and abounds in well-executed illustrations which add greatly to the attractiveness of the work as well as to the elucidation of the text.

To all who are engaged in the practice of dentistry, as well as to students in course of preparation for practice, this is a book to be heartily commended as a thoroughly logical and scientific treatment of the subjects within its scope, and sufficiently comprehensive to cover the needs of the dental practitioner.

SUGGESTIONS REGARDING CARE OF THE MOUTH AND TEETH. Published by the Bureau of Public Health Education of the Department of Health, City of New York, 1917.

The Department of Street Cleaning of the City of New York is issuing to its employees a booklet of "Suggestions Regarding Care of the Mouth and Teeth," in which the essentials of the subject are set forth in terse and simple phraseology, accompanied by illustrations portraying the best technique for brushing the teeth and for the use of floss silk in removing food particles. The objects which justify the issuing of the pamphlet are set forth in the following statement printed on the cover:

> To save your health and save your money—*Save your teeth!*
>
> In 1916, street-cleaners suffered from over 100 different illnesses.
>
> But nearly one-third of all the time lost on "sick leave" was on account of rheumatism and indigestion. These diseases caused a salary loss by employees of over $20,000!
>
> Rheumatism and indigestion are often due to dirty and decayed teeth.

The booklet is a thoroughly practical attempt to improve hygienic conditions among the body of workers to whom it is addressed. It is deserving of extensive circulation among the classes of workers who have not already learned the importance of oral hygiene as a prophylactic measure against bodily disease.

REVIEW OF CURRENT DENTAL LITERATURE

[*Journal of the Royal Microscopical Society*, London, April 1917.]

The Parasitology of Pyorrhea Alveolaris.

BY AUBREY H. DREW AND UNA D. GRIFFIN.

The investigations forming the subject matter of this paper were carried out in the bacteriological laboratories of the Royal Dental Hospital and the Royal Institute of Public Health. The authors consider this report as a preliminary communication.

A special and apparently highly successful technique for the collection of material for study is described fully.

The organisms were examined alive and also as stained by iron hemotoxylin, after fixation in Schaudinn's fluid. Giemsa's method was less satisfactory.

Some three hundred cases have been systematically examined and the presence of amœbæ has been demonstrated in every one. Twenty normal mouths were also examined, and in not one case, provided there was no trace of gingivitis, could amœbæ be demonstrated. Trichomonas was found in 10 per cent. of the cases. At least six species of spirochætes or treponemata were found, viz, S. buccalis, S. Vincenti, S. refringens, T. macrodentium, T. microdentium, and T. mucosum. The immense number of these organisms is perhaps the most striking feature of a typical smear from pyorrhea.

Two flagellate organisms, hitherto undescribed, were noticed. The first form strikingly resembles the trypanosomes, relatively scarce, a long sinuous body provided with an undulating membrane. The anterior end is broad, and ends with a flagellum, and the posterior end thins off to a short point. The average breadth of body in this form is about 1.5 to 1.8 micron, length up to 15 microns. The second form of flagellate, present in a majority of cases of pyorrhea, is somewhat sickle-shaped, provided with a single lateral flagellum, which appears to be connected to a rudimentary undulating membrane.

Besides these protozoa, streptococci are found in every case. Fusiform bacilli and vibrios are often extremely numerous; also M. catarrhalis, M. albus, M. aureus, and M. tetragenus, large numbers of leptothrix, and others unidentified.

The amœbæ present appear to belong to at least two distinct species—(1) A larger form 10 to 30 microns in diameter, well defined ring-shaped nucleus with chromatin distributed at the periphery—E. gingivalis, Gros. (2) A smaller form, 15 to 20 microns in diameter; nucleus takes a faint purplish blue stain from polychrome methylene blue (as a vital stain, nucleus of form No. 1 does not take this stain); nucleus shows a big central karyosome, containing the whole of the chromatin. Observed with form No. 1 in 0.65 per cent. of cases examined.

Attempts at artificial cultivation of amœbæ No. 2 were successful. The medium consisted of—

2 per cent. agar jelly,	90 cc.,
Ordinary nutrient agar (+ 10 in reaction),	10 cc.
Tyrosin,	0.1 gram
Cholin,	0.1 "
Creatin,	0.1 "

—melted, poured in Petri dishes (3 in. diameter), infected material spread over surface; plates placed in Bullock's apparatus and incubated anaerobically at 37° C.

The life-history of the amœba (No. 2) was quite carefully studied. Shortly following excystment a flagellated stage was observed. The authors' opinion is that this particular species is semi-parasitic, and they suggest as its name *Amœba buccalis.*

Subcutaneous injections into rabbits of suspensions of amœbic cysts led to the formation of swellings containing a thick pus. No evidence of an amœbolytic serum was forthcoming.

In a large number of pyorrhea cases, examination of concentrates of feces has shown cysts bearing a very striking resemblence to those described as E. minuta. The authors suggest that these cysts probably represent those of E. gingivalis, and they are inclined to think that many of the so-called "minuta" infections are really of this nature.

Cysts were obtained—in pure culture—in large quantities. Alcoholic and saline extracts of these cysts were used as antigen for complement-fixation tests in twelve advanced cases of pyorrhea. In only one was there the slightest evidence of any fixation of complement.

The specific problems of this study may be answered as follows—

(1) Amœbæ are invariably associated with pyorrhea.

(2) Two species of amœbæ exist in pyorrhea pockets—(*a*) E. gingivalis and (*b*) A. buccalis.

(3) These organisms have little to do with the etiology of the disease.

(4) In the authors' opinion, once mechanical injury has occurred to the gingiva the spirochætes play the chief parts in the disease, causing tissue destruction and pocket formation.

Of clinical interest is the note that the use of arsenic preparations, *e.g.* atoxyl and salvarsan, was of great value. In all cases vaccine treatment in addition is to be strongly recommended. Emetin has not been found to be of the slightest value in treatment.

Excellent plates accompany this article.

[*New York Medical Journal*, August 11, 1917.]

Diagnostic Teeth (Syphilis). By Percy W. Roberts.

There is abundant evidence that the value of the teeth as an aid in the diagnosis of certain morbid states, notably bone and joint lesions, is very much underrated. There have come under the author's observation during the last few years numerous cases of congenital syphilis which had undergone long periods of treatment based upon incorrect diagnoses, and in which inspection of the teeth with an intelligent interpretation of the findings would have given a clue to the true pathology and shortened immeasurably the period of invalidism.

The recognized pathognomonic dental stigmata of syphilis are—(1) The notched maxillary first incisors; (2) cuspal erosions of the permanent first molars; (3) multiple and systematic dystrophies of the permanent teeth, and multiple dystrophies of the deciduous teeth.

In addition, there are other anomalies of form and arrangement of the teeth frequently seen in congenital syphilis. Possibly 80 per cent. of such anomalies are ascribable to syphilis.

One of the common malformations is the absence of dental units, which may be so extensive as to produce an entirely edentulous jaw. There are also symmetrical erosions of various kinds, striking irregularities of form and distribution, anomalies of spacing, microdontism, cleft teeth, white sulci, and the tendency to early decay.

The one anomaly upon which Roberts lays special emphasis is abnormal spacing between the two maxillary first incisors. He holds that this, while not absolutely and invariably pathognomonic, still is of sufficient frequency in cases of congenital syphilis to demand the strictest attention.

Twelve case histories and also illustrations are given.

[*Anatomical Record*, Philadelphia, November 20, 1916.]

The Golgi Apparatus. Personal Observations and a Review of the Literature. By Alwin M. Pappenheimer.

The intracellular organella were first described by Golgi in 1898 under the self-explanatory and descriptive name "apparato reticolare interno." The probable synonyms introduced in the literature since then are Binnennetz, centrophormia, Nebenkern, Zentralkapsel, Holmgren-Golgi apparatus, Golgi-Kopsch net or apparatus, and trophospongium. To avoid any ambiguity Pappenheimer employs the non-committal term, Golgi apparatus.

The histological technique is too nice and too detailed to be given in an abstract. The most constant results have been obtained in the tissues of young animals.

Among the various types of tissue cells in which this apparatus has been demonstrated are the ameloblasts (not referred to by Pappenheimer), the pulp cells, and the odontoblasts (Massenti, 1914, "L'apparato reticolare interno del Golgi nel germe dentale," *Monit. Zoöl. Ital.* 25, 107; Ramon y Cajal, 1914, "Algunas variaciones fisiológicas y patológicas del aparato reticular de Golgi," *Trab. del Lab. de Invest. Biol.* 12, 127).

Massenti, using pig embryos, describes the apparatus as a large skein occupying almost the entire cytoplasm of the pulp cells and odontoblasts. According to Cajal, as the odontoblast becomes differentiated from the connective tissue element of the pulp, the net increases in size and comes to form a large oval rather granular mass, occupying the supranuclear [distal?] portion of the cytoplasm.

The sole reference to this structure which could be found in strictly dental literature appeared late in 1916 in *La Odontología,* Madrid, by Ramon y Cajal.

[*New Zealand Dental Journal,* May 1917.]

Local Anesthesia in Camp Practice. By Capt. Murray K. Litchfield, N.Z.D.C.

This interesting and instructive paper is based on the results of the author's extensive experience with cocain, anocain, and novocain in the practice of dentistry in the dental corps of the army of New Zealand. After giving a brief history of the development of local anesthesia in dental operations he details the comparative results obtained from novocain and cocain, the latter being used in connection with Ringer's solution and adrenalin as novocain is generally used. The formula he uses is—

Cocain hydrochlorid,	50 grains
Glycerin,	4 drams
Listerine,	1 ounce
Carbolic acid,	15 minims
Ringer's solution,	10 ounces

To every ounce of this solution is added 19 minims of adrenalin chlorid solution (1 : 1000).

Litchfield does not offer his experience as a plea for cocain, but was led to the use of this substitute for novocain because of the difficulty in procuring novocain, and states frankly that he prefers novocain when procurable. He, however, reports remarkable success in the use of the cocain solution, and in summing up his deduction says:

"As a result of cases studied I have come to the conclusion that the symptoms apparent of novocain injection are more unpleasant to watch, and seem to cause the patient more nervous excitement, worry, and bodily discomfort than is the case with cocain, but they pass rapidly away, and are not nearly so dangerous as the less obvious effects of cocain. But the great point is that of a one-half per cent. cocain solution, 8 syringes contain 1 grain of the drug, which is really double the maximum dose; while of 2 per cent. novocain solution, 14 syringes contain only one-half gram, or 7.7 grains, which is a safe dose. So that with fourteen syringes of novocain one can naturally cover more ground than with eight syringes of cocain, and that very much more safely. This is a great point if anything serious occurred to the patient, and questions had to be answered at an inquest, as, for instance, the actual quantity of the drug itself injected in the given case, when, naturally, an overdose of cocain would call for comment, whereas a medium dose of novocain, even if it had had a fatal effect, could not be so strongly condemned. As a matter of fact, out of all the cases treated through eleven months, there has never been one case of really serious collapse, although several of minor collapse have occurred. Quite a considerable number of cases—particularly with one anesthetic used—vaso-constrictine in water only—were nasty cases temporarily; by which I mean that unpleasant symptoms manifested, and then these symptoms passed away, and the operation was gone on with. In fact, at one time, these symptoms were almost looked for as routine occurrences, unpleasant but necessary, and to be put up with. However, with the improvement in the anesthetic that was brought about by study and experiment, these bad symptoms have been to a great extent eliminated."

With regard to the susceptibility of recruits to the effects of cocain, he says—

"In treating cases in camp certain things have become manifest. One outstanding effect of camp life and training on recruits is the increased dose of cocain that they can stand after they have been in training some months. This fact must be plainly noticeable to anyone doing injection work under these conditions; and to make more certain still, I have taken cases and made a test injection in the same man after a period of time has elapsed. Also, I have, in a few cases where marked susceptibility to cocain was shown, injected anocain—supposed to be a preparation of novocain—at a later date, and marked the result. In these test injecticns, with both cocain and anocain, the results have almost without exception been negative, thus proving that the training and building-up of the systems of the men made them able to stand the test injections with much less bodily discomfort."

The author concludes his paper by saying that—

"Undoubtedly cocain is quicker, more certain, and more penetrating than novocain, but it is more dangerous, cannot be used in such big doses in extensive cases, cannot be sterilized by boiling, and so requires the injection of more extraneous substances—preservatives, etc.—with it; and even then does not keep in solution so well. The greatest point in favor of novocain is that you can use so much more of the crude drug than you can of cocain with safety, and so in the big cases cover more ground. It is not the amount of solution that you inject that you must know, but the amount of the actual drug that the solution contains, and this is where I consider that one is liable to get into trouble with proprietary solutions. A preparation that contains cocain in solution, over 1 per cent.—say 1¼ per cent.—needs only about three syringefuls to contain one grain of the crude drug, so that overdosing is, with these preparations, very easy, and it is my opinion that far more cases of trouble occur from overdoses than from idiosyncrasy."

[*Annals of Surgery*, New York City, August 1917.]

Tumors of the Gasserian Ganglion. BY ERNEST SACHS.

Tumors of the Gasserian ganglion have so rarely come to operation that this report of but a single case, together with a concise review of a thorough bibliography and the symptomatology, seems justified.

Anatomically there are two groups of these growths—(1) those containing nerve elements and (2) those arising from the dura mater but not involving the ganglion proper. A much more valuable clinical classification would seem to be a grouping into early and late cases. If certain diagnostic features are recognized, these cases may come to operation still earlier and have permanent relief.

Curiously, the majority of these tumors have occurred on the left side.

The two conditions which may be mistaken for this condition are tic douloureux and sphenoidal sinus diseases. In true tic douloureux the pain is never persistent or continuous, but is intermittent in character and comes in spasms. External stimuli may influence the severity of the pain and external applications of heat or some drugs may bring temporary relief. In true tic douloureux one never sees any cranial-nerve palsies.

In sinus disease, the pain may be persistent and of the same character as in ganglion tumor, although never, Sachs believes, so severe or excruciating; there may be involvement of the abducens nerve, though this is unlikely, but it is quite impossible ever to have involvement of the motor branch of the fifth nerve, since anatomically it is too far from that region.

Severe continuous pain in the distribution of the trigeminus with paresis of the motor branch justifies at once the diagnosis of tumor of the Gasserian ganglion. Sachs does not believe, however, it is necessary to wait until the motor branch of the fifth nerve is involved. As soon as an infected sinus has been excluded, the persistent pain, as distinguished from the intermittent spasmodic pain of tic douloureux, justifies an operation on the ganglion on the suspicion that a tumor is present.

Histologically the tumor removed from Sachs' case approximated very closely the type of an endothelioma.

[*Medical Review*, London, June 1917, p. 190.]

Eau de Cologne in Toothache. BY DU MONT.

This note originally appeared in the *Deut. Med. Wochenschrift*, S. 323. The author first accidentally experienced relief from odontalgia upon spilling eau de Cologne on his nasal mucosa. Later, in applying this knowledge, he employed sulfuric ether. The method of administration is as follows: A few drops of sulfuric ether are poured on a plug of cotton of the size of a pea, which is inserted in the nostril on the side where the pain is located. Light pressure on the nose, when the head is bent back, is sufficient to squeeze a few drops out of the cotton on to the nasal mucosa. The patient usually removes the cotton as quickly as he can from his nose, and the pain is gone, not merely for a few minutes but for a considerable time. This method is equally effective whether the pain is due to rheumatism, dental caries, or periodontitis.

[*Texas State Journal of Medicine*, Fort Worth, July 1917.]

Pyorrhea a Vital Factor in Insurance Examinations. By John L. Davis.

It is essential for the examiner to inspect the mouth carefully for evidence of pus pockets connected with the teeth. They may explain a perplexing history of rheumatism, albuminuria, or other pathologic condition in the applicant. Such diseases cover the majority of insurance losses after forty years of age, and hence the medical man, to whom in a measure is intrusted the longevity and good health of policy-holders, should be vitally interested in this subject.

[*Journal of the American Medical Association*, August 25, 1917.]

Roentgenographic and Microscopic Studies of Tissues Involved in Chronic Mouth Infections. By Arthur D. Black.

This statistical contribution to the doctrine of oral foci of infection in systemic disease is so full of carefully detailed and dependable observation that this paper is worthy of the closest attention. Black presents here a preliminary report, looking toward the goal of expressing in figures the relationship existing between mouth foci and the systemic effects. Such a method is necessarily purely inferential in its nature and not conclusive.

During the past year he had roentgenograms made of all the teeth and adjacent bone for about 400 persons, for the special purpose of determining the frequency and extent of the infections of the jaw-bones. It is important to realize the fact that for persons under forty years of age the figures probably represent very nearly average conditions. The results of a study of 300 individuals are summarized in a table which includes age, systemic symptoms, number of teeth, disease of the periodontal ligament, alveolar abscess, number of teeth having good or poor root-canal fillings, with number of abscesses in relation to each group, and the number of teeth without root-fillings, which were abscessed. Inasmuch as a thorough physical examination was impracticable, the information pertinent to systemic condition was obtained from a standard questionnaire.

From this tabulation it is apparent that, of those from whom positive histories were obtained, there is a decided increase with advancing years, which follows closely the percentage increase of mouth infections.

Of 853 root-canal fillings 47 per cent. showed abscesses; the average of occurrence upon well-filled roots was 8 per cent.; upon poorly filled roots, 65 per cent.

Black considers this study as merely a precursor to one including several thousand persons. At present his conclusions are:

Suppurative detachments of the periodontal ligament are in practically all cases permanent, whether the detachment be at the side of the root or the apex. The area of bone destroyed about the root-apex is not so important as the extent of the destruction of the periodontal ligament. There is no hope of reattachment of the surrounding tissue to the root, and if such teeth are permitted to remain in the mouth—excepting those which are operated on by resection—it should be with the definite understanding that they are necessarily continued as a menace to the health of the individual, and that the use of such teeth in mastication overbalances this menace to health. In such cases we are using our own best judgment as to the patient's general physical condition and resistance. We must do this with the thought ever in mind that nephritis, endocarditis, cholecystitis, and other secondary effects are so insidious in their onset that the condition is likely to be serious, and the patient even beyond the possibility of recovery, before it is discovered by the physician.

[*American Journal of Public Health*, Concord, N. H., July 1917.]

The Present Status of and Necessity for Mouth Hygiene. By Sidney J. Rauh.

Not only the dentist and the general practitioner but also the layman is today cognizant of the delicate interrelationship between oral health and general health. For Rauh there are three great social diseases—tuberculosis, venereal diseases, and dental caries. In each of these, preventive measures are the only really effective ones.

The larger efforts which constitute the present status of the oral hygiene movement in the United States are—

(1) Special institutions for the treatment of children's mouths, *e.g.* the Forsyth and Eastman infirmaries.

(2) School clinics, which Rauh inclines to prefer to the more centralized institutions. In almost every instance school clinics have been instituted through volunteer efforts on the part of dental organizations or small groups of dentists. Detroit has made most progress in this direction, appropriating $20,000 annually.

(3) Educational propaganda, which must be intelligently pursued by both the initial intensive campaign and the equally indispensable "follow-up."

(4) Clinics in hospitals; without these no hospital is complete.

(5) Clinics in commercial plants. Probably one of the most encouraging results of the oral hygiene propaganda has been the recognition accorded by the business man.

These five groups cover the efficient prophylactic forces working against dental disease, and future endeavor must be expended along these lines.

[*British Medical Journal*, London, July 7, 1917.]

A Note on the Treatment of Gunshot Injuries of the Mandible. By J. F. Colyer.

The Department of Oral Surgery of the Harvard Surgical Unit. By V. H. Kasanjian.

A Note on Oral Surgery. By A. C. Valadier and H. Lawson Whale.

Colyer has given in full the views outlined in his note in the issues of the *British Dental Journal* for March 15, April 2, and April 16, 1917.

Gunshot injuries of the mandible differ materially in their character from the fractures met with in civilian practice. In the former case, there is often considerable loss of tissue, comminution of the bone, and a corresponding increase in the displacement of fragments.

The treatment consists of three phases—(1) control of sepsis, (2) approximation of the fractured ends, and (3) fixation of the parts. The sequence of these phases is very important. The all-important factor is speedily to rid the parts of sepsis, and not to fix splints until the sepsis is thoroughly under control.

The question of the removal of sepsis mainly centers around the retention of the teeth in the region of the fracture. All teeth in relation to the fractured area should be removed. Upon this point Valadier and Whale give a diametrically opposed opinion, viz, a tooth should never be removed if there is any chance of its subsequently forming a useful support for dentures or other appliances. Even in the line of fracture the extraction of a tooth may be left until later. Kasanjian recognizes the importance of the early reduction of sepsis, and toward this end advises small and timely operations with a local anesthetic, to remove foreign bodies, fragments of teeth or roots, and detached segments of bone.

Colyer is insistent that the fractured ends be approximated, narrowing the arch and sacrificing a correct occlusion willingly for a mandible firmly united, capable of bearing the strain of an efficient denture. To Colyer there is nothing to support the view that fresh bone would eventually bridge the gap of lost tissue. In contradistinction to this view, as Kasanjian indicates, there is a growing realization of the importance of immobilization or reduction of maxillary fractures at the first possible moment along the lines of the normal occlusion of the teeeth.

Colyer finds for the fixation of the fragments the metal Gunning splint to be the most self-cleansing and the most reliable appliance, fixed in position with oxyphosphate of copper. Hooks, elastic bands, and wires only add to the difficulty of cleansing the mouth.

In addition to what has been given above, the salient features of Kasanjian's paper are the following:

The advantages of segregating oral surgery cases at special hospitals are self-evident.

Local anesthetics are indicated for even extensive plastic operations.

If general anesthetics are necessary, special precautions are needed to prevent the entry of septic material into the air-passages.

The special septic complications, apart from the usual condition of local sepsis, which are recognized, are septicemia, cellulitis, and broncho-pneumonia.

Among 400 cases of gunshot wound of the face with fracture of the upper or lower jaw, there were 34 cases of secondary hemorrhage (8.5 per cent.), and of these 7 were fatal. Injury to one or both lingual arteries has been the chief cause of serious bleeding. Recently better results in control of hemorrhage have been obtained by direct ligation of one or both lingual arteries whenever the condition of the wounded parts was indicative of injury of these vessels.

Valadier and Whale note as the most common sequelæ of war injuries to the jaw, recurrent and secondary hemorrhages, inhalation pneumonia and gangrene of the lung, and mediastinitis.

[*Dental Items of Interest*, New York.]

The Relation of Mouth Infections to Gastric and Intestinal Disorders. By J. M. Rector.

In reviewing 683 cases which have come under treatment during the past six years, Rector found from examination of the stool that fully 80 per cent. of the cases were in the habit of swallowing practically unchewed food. Sixty-two per cent. of total cases had markedly deficient masticating surfaces. One hundred and thirty cases had mouth infection, or 18+ per cent.

Three illustrative case histories are given, the lessons from two of which are unequivocal.

Case I was a man with general syphilis and syphilitic gastritis as a complication. The lesson learned from the treatment of this case was that the patient could not accept antisyphilitic treatment until his mouth infection was relieved.

Case II is cited to show that mouth infection was probably induced by general low resistance, and that the mouth infection soon became the principal focus of infection, adding directly to the disability of the patient and contributing to the extreme prostration and skin inflammations. The dental management was not satisfactory until the digestive tube was given an opportunity to supply the energy for repair.

If infections of the mouth are not removed before operation for ulcers of the stomach and duodenum, the ulcers are apt to recur, and also the likelihood to hemorrhage is greater.

Rector uncompromisingly condemns the ruthless extraction of teeth. In his words, "If there is an infected area, the infection must be removed—not the area."

[*Colorado Medicine*, Denver, July 1917.]

Diseases of the Eye Resulting from Lesions of the Mouth and Throat. By J. A. Patterson.

Two original cases of dental interest are mentioned by Patterson. The first case is that of recurring attacks of iritis which permanently disappeared after removal of a maxillary molar on the side of the affected eye. This tooth was loose and surrounded by almost a pocket of pus.

The second case presented a history of what apparently had been a prolonged and severely painful keratitis. Five years later the eye became painful, tender, with distinct pericorneal redness. A diagnosis was made of sluggish iridocyclitis. A mandibular molar and two other teeth, which were diseased, were extracted. Within six weeks the cornea was almost clear, the vision greatly improved, and the fundus visible.

[*New Orleans Medical and Surgical Journal*, August 1917.]

Extreme Prognathism Relieved by Bilateral Resection of the Mandible. By Hermann B. Gessner and Paul DeVerges.

This is a brief report of a successful operation for correction of a marked prognathism. Three figures illustrate the condition before and after the operation. A fourth figure shows the orthodontic appliance employed for the orientation and fixation of the three segments of the mandible. The operative technique followed was that of Blair of St. Louis. A portion of the mandible was removed from the right and left premolar regions under local anesthesia. No attention was paid to the location of the mental foramina. The premolars had been extracted several days before the operation, and the oral cavity had been put in a thoroughly healthy condition.

PERISCOPE

Protecting a Lancet Blade.—It has been recommended for a long time to protect that part of a lancet blade not needed in lancing the gums, for both adults and children, especially the latter, by wrapping it with gauze, leaving only the end of the blade exposed. Any sudden movement of the patient would not then endanger the soft parts. Protecting gauze, thus applied, is difficult to keep in place, and unless tied with thread, may loosen and be a source of annoyance. A much better plan is to cut a Johnson cotton roll slightly shorter than the blade and press the blade through the center of it, exposing only as much of the blade as is required at the end. The roll holds tightly on the blade, and can be safely pressed against the lips or cheeks to hold them away, while the point reaches the spot desired.—*Australian Journ. of Dentistry.*

New Dental Sign of Inherited Syphilis.—R. Sabouraud (*Presse médicale*) calls attention to the presence of the rudiment of a supplementary cusp on the internal surface of the upper first molar. Often this unusual mammillary eminence is short, rounded, and flattened against the body of the tooth; in other instances it projects more markedly, and is separated from the tooth by a distinct incisure. This peculiarity is of importance because it is easily recognized, occurs as frequently as any other single dental stigma of syphilis, and is generally unaccompanied by any of the other characteristic stigmata. It may be present in an otherwise perfect set of teeth, and is of distinct diagnostic value. In a series of twenty consecutive cases its characteristic nature was uniformly shown by a positive Wassermann test. In two cases the sign led to discovery of syphilis as the cause of inveterate headaches, which yielded promptly to anti-syphilitic treatment.—*International Journal of Surgery.*

Case of a Rare Foreign Body in the Oral Cavity.—A child of six was brought to the author on account of an impediment of speech and a foul breath. At the age of two the boy was supposed to have swallowed or inhaled a foreign body. Evidence of its presence could not be found at the time, yet for weeks he had a sore mouth, the saliva was blood-stained, and he refused to eat. He was well for two years before the mother noticed speech defect and foul breath, for which no cause could then be found. This persisted for two years, when the author was consulted. He noticed an extreme mobility of the tongue. It was found that the frenum had been entirely severed and that there was a necrotic area on the floor of the mouth of the size of a dime. A metallic object which proved to be a ring was encircling the tongue, and was completely buried in the tissues. The ring was cut and removed. Complete recovery ensued.—JOHN L. LOUGEE, *The Laryngoscope*—per *Amer. Journ. of Surgery.*

What Shall be Done with Pulpless Teeth?—The question, What shall be done with pulpless teeth? is more prominently before the dental profession at this time than any other question. How shall it be answered? It cannot be fully answered now; the data are insufficient. I am of the opinion that if a pulpless tooth has one or more of its roots partially denuded of peridental membrane, that part of it uncovered is dead, therefore a foreign body. We are told by some that if the root-canals of such teeth and the abscessed area be made aseptic, and the root-canals filled to their apices, no further danger need be anticipated. Unless the cementum is covered so that it is completely protected from bacteria, the dead portion will be a constant menace. Doubtless, in some instances, apical abscesses with denuded cementum may be rendered sterile by treatment, but who has proved that such an area will remain sterile indefinitely? Temporary immunity is not sufficient. Dead uncovered cementum is just such an area as offers the best possible field for the collection and growth of bacteria. If we can be assured that the blood streams will never contain pyogenic organisms, and the bacteria cannot reach the dead cementum from any other source, then danger from subsequent infection of such roots is excluded; but this cannot be anticipated until we know some way of barring bacterial invasion from the body.—T. L. GILMER, *Dental Review.*

Taking a Bite for Crown or Bridge Work.—One of the most difficult items in operative dentistry to contend with is the taking of a satisfactory bite, where the occlusion is extremely close. The following is submitted for its possible assistance to the operator in such cases. When the wax or compound bite is removed it often breaks in two pieces, making it difficult to get a perfect cast for the occluding surface or surfaces to be articulated to the crown or bridge to be constructed; or breaks when placed on the plaster model. A good, strong, sharp bite can be obtained in the following manner: Take a piece of the linen which comes on each side of a sheet of vulcanite rubber, cut it about the length and width of the bite to be taken, then place the bite wax above and below the piece of linen, and take the bite in the usual manner. The linen holds the bite together, and prevents a patient from biting clear through. Do not use paper, as paper becomes wet and tears.—H. F. SCHLIEFFARTH, *Dental Review.*

Ruthless Extraction of Teeth.—Within the past six months a number of dentists have informed me that countless teeth are being removed without justification, on the advice of physicians, usually following an X-ray examination—by amateurs in many instances. In well-authenticated cases in which one or two teeth were the seat of peripheral infection, physicians have gone so far as to give emphatic directions to the effect that all of the remaining teeth be extracted. For example, one of Philadelphia's best-known specialists in extraction was requested by a physician to pull out all of a certain patient's teeth—twenty—but he courteously, though firmly, declined to do so.

It seems to me that the rapidly growing custom of sacrificing teeth, many of which are merely *suspected* of being septic, cannot fail to arouse the most ardent activity of dentists in opposition thereto, and must prove the ultimate chagrin of the medical profession. It would appear that an amazingly low estimate is being placed on the value of human teeth by an increasing number of physicians, who should appreciate the importance of a good masticating apparatus to the digestive function—to the maintenance of health.

I do not mean to disparage the significance of these latent chronic septic foci as a cause of secondary systemic infections, or to depreciate investigations in this, comparatively speaking, new field of endeavor. The object of this letter is to utter a word of warning, with a view to lessening what I believe to be an unwarrantable present-day sacrifice of the masticating surface, and to spare the medical profession the adverse criticism of the future, by a broader conception proper to the subject of oral sepsis and its management in the present.—J. M. ANDERS, M.D., *Journ. Amer. Medical Association.*

Indications and Contra-indications for Root-end Amputation.—All root ends about which there is a chronic infection, the apical pericemental membrane is destroyed, and the root ends absorbed or not absorbed, are in a condition calling for either extraction or root-end amputation, the choice being based upon whether more or less pericemental membrane over the root has been destroyed.

Indications. Patients must be in good health. Where the involvement does not exceed one-third of the root length of any of the ten upper anterior teeth or the eight lower anterior teeth; all other teeth, if amputated, I look upon as less favorable. The tooth must contain a perfect aseptic root-canal filling beyond the point of amputation.

Contra-indications. Root amputations must not be performed on patients who are suffering from a severe secondary involvement which you have reason to believe was caused or influenced by chronic focal infections. Root ends that give a history of chronic infection, past or present, should not be amputated beneath the antrum. Root ends should not be amputated if that portion of the root which is to remain contains a bacteria-laden or a defective root-canal filling. Root-end amputations become less favorable as the bone involvement extends in any direction from the root end more than one-third the length of the root. Whether it is good practice to close the wound by suturing can only be answered after a sufficient lapse of time to gather the evidence demanded. At the present time the success of root amputations is in a position similar to that occupied by the root-canal problem about five years ago, for at that date the profession felt, after a root-canal was filled, that so long as the tooth remained comfortable the operation was a success. At the present time many of those performing root amputations are basing their opinion of successes upon the fact that the tooth is comfortable, or upon radiographs of a few successful cases which only cover a small percentage of all roots amputated. In other instances we find men rushing into print in a few months, or a year or two at the most, after they have started to do the operation, or have changed their technique, and claiming from 90 to 100 per cent. successes, presenting radiographs showing partial filling-in of the bone, but this is only partial proof of the ultimate outcome. At least five years, or better, ten years, will be required to determine the probable outcome, or to furnish absolute proof that the infection is eradicated and does not return. The exposed surface of the root at the point of amputation, which is never covered by the pericemental membrane, so far as our present knowledge is concerned, leaves a very weak and questionable point, which may favor the return of the infection in too large a percentage of cases, when the patient comes to a degree of lowered resistance, to warrant the continuation of this type of operation. The propriety of root-end amputations will be more thoroughly understood five or ten years from now, for this amount of time will be required for the conscientious, painstaking man who has the training necessary to assist in arriving at a correct conclusion. Following the above outline, I am amputating the root ends in the most favorable cases, and extracting the others until the necessary evidence is furnished to cause one to discontinue the practice or to advise this operation.—W. H. G. LOGAN, *Dental Review.*

Deep Breathing a Cure for Weak Lungs.—If the development of strong lungs meant the outlay of hundreds of dollars there might be an excuse for some cases of weak lungs. But all that is needed is pure fresh air, which God has given to all of us, and knowledge of the proper way to breathe.

The following exercises, if performed faithfully and regularly, will develop a wonderful pair of lungs for you if they are in good condition now. If your lungs are inclined to be weak, begin these exercises today, and in six months—or less—you will note an improvement so great that your physician will pronounce your lungs "sound as a bell."

(1) Standing near an open window, inhale deeply twenty-five times each morning upon arising, and as often just before retiring. Hold your breath about ten seconds; then exhale with as much force as possible.

(2) Take in all the air your lungs will contain. Hold your breath, and expand your back and chest muscles. Let your arms hang loosely at the sides. Aim to work your muscles about fifteen times while holding your breath. Repeat this exercise about ten times or oftener, if you are not tired.

(3) With the flat of your hand slap your chest. Slap hard—and on every part of your chest. As soon as your skin becomes red, move the flesh back and forth and up and down, using the palm of the hand for the massage. Do this for about three minutes.

(4) While standing erect, take three long breaths, then exhale. Follow with twenty-five short breaths. Alternate in this way for about three minutes. When taking deep breaths let them come through the nose and out of the mouth; draw in and also exhale the short breaths through the nose.

(5) Make yourself a strong belt of rubber bands. Put this around the top part of your chest. Take a deep breath, expanding the chest against the band. Repeat this until you are tired. This exercise is wonderful as a chest developer, and also greatly increases the lung power.

(6) Take a sack filled with from six to ten pounds of sand; lie flat on your back and place the weight on your chest. Raise and lower your chest by breathing deeply and exhaling completely about fifteen times. Then raise your head and legs with the weight on your chest. Take as many deep breaths as is possible while you are in this position. Gradually increase the weight up to thirty or forty pounds.—JAS. J. CORBETT, *North American,* Philadelphia.

Advantages of the Jacket Crown.—Since the radiograph has come into general use we realize more than ever the importance of preserving the vitality of the teeth whenever possible, as so much trouble can be traced to poorly filled root-canals and irritation to the gingivæ from poorly constructed fillings and crowns. The jacket crown has a tendency to prevent the recurrence of caries, as the entire crown of the tooth is re-enameled with porcelain, and it does not irritate the gingivæ. As porcelain is also a non-conductor of the thermal changes, we eliminate the danger of the death of the pulp from shock that might occur from a restoration with a metallic filling or crown. When properly made the porcelain jacket crown is ideal from the esthetic as well as from the prophylactic standpoint.

Jacket crowns are indicated in the following cases: Peg laterals, malformed or discolored teeth, when a tooth is over one-third broken down; badly eroded teeth; deciduous teeth that may remain in an adult mouth—radiograph the case and ascertain that there is not an unerupted tooth under the deciduous tooth. Pivot crowns that are off color or do not fit may be split off with thin carborundum stone, shoulder cut on root, impression taken and the jacket crown made in the usual way, thus eliminating the necessity of removing the post from the canal.

Jacket crowns may be used to advantage

when opening the bite. All banded crowns that irritate the gingivæ should be replaced by porcelain jacket crowns. Anterior teeth that are rotated may be corrected by jacketing. Lower incisors, when badly broken down, should be jacketed.

The porcelain jacket is the most natural-looking crown, and possesses the greatest degree of translucency. Individual peculiarities may also be reproduced with jacket crowns to harmonize with the natural teeth.

A vital tooth that is jacketed is much stronger than one that is devitalized; reaming out the canal for the reception of a pivot tooth materially weakens the latter; then, again, a post in the canal has a tendency to act as a wedge during mastication, and sometimes splits the root.

In jacketing we bind the tooth together and have the strength of a Richmond crown without the irritation from a band, because the shoulder-joint of the jacket crown does not impinge on the gingivæ. The smallest shoulder that can be trimmed is sufficient, as the strength of a jacket crown does not depend on the bulk of porcelain but on the close adaptation of the jacket crown. In mastication the force is more nearly equally distributed, and the root takes the strain.—HUGH AVARY, *Journ. N. D. A.*

More Discoveries by Dakin.—Dr. H. D. Dakin, well known by reason of his contribution to antiseptic surgery, has recently introduced two new chemical substances that promise to be of the utmost value to physicians and the community at large.

The first of these is a tablet for sterilizing water, which he has called halazone. This is described in a paper published in the *British Medical Journal* for May 26th. Halazone chemically is para-sulfon-dichloramino-benzoic acid. It belongs to the same general family as chlorazene; in other words, it is a chloramine into which the benzoic-acid radicle has been introduced. It is made into a tablet with sodium carbonate and common salt. The tablet thus made is stable—that is, it will keep for a number of months without apparent decomposition.

This halazone is an exceedingly powerful germicide. In dilution ranging from 1 : 200,000 to 1 : 500,000 it will destroy such water-borne organisms as the colon bacillus, typhoid bacillus, dysentery bacillus, and the cholera vibrio. A small tablet containing only 1-16 grain of this powerful chemical will effectually sterilize a quart of water. Moreover, it is inexpensive; a thousand of such tablets can be profitably sold for a dollar. There has long been a demand for a tablet of this kind, and there is no doubt that it will have a ready sale among travelers, campers, automobilists, in rural districts where well-water is unsatisfactory, and in all communities where typhoid fever and other water-borne diseases are present. This tablet also is likely to be used extensively by soldiers in the field, likewise in commercial and industrial establishments, hospitals, and other large institutions.

Dakin's other discovery is a preparation called by him dichloramine-T. This is very similar, in a chemical way, to chlorazene, but contains even more chlorin than the latter antiseptic. It differs from chlorazene, however, in being soluble in certain oils, but insoluble in water, while chlorazene, on the contrary, is soluble in water and insoluble in oil. In other words, dichloramine-T will be employed in all conditions in which an oily vehicle seems desirable. It has the very great advantage of being capable of use in very high concentration; in other words, it may be used from twenty to forty times as strong as the customary 0.5 per cent. solution of the hypochlorite, without causing irritation.—EDIT., *Amer. Journ. of Clinical Medicine.*

Interpretation of Radiographs.—It is evident that many errors are made, both by the dentist and the physician, in the interpretation of radiographs. An incident: A physician whose mother was suffering from arthritis brought films to me made from her edentulous mandible, and from his readings of the films he was of the opinion that there was indication of a sequestrum of dead bone. I told him that no definite conclusion could be reached unless I could compare the pictures with the jaw. The radiograph did seemingly indicate a sequestrum. On observing the patient as she came into my office at a later date, it was not difficult to see by her walk and the enlarged joints of her hands that she had an arthritis. On examining the mandible at the point that the radiograph indicated a sequestrum, I found it free from all signs of infection. There were no sinuses, no swelling, no induration of the soft tissues, and no cervical gland involvement. Some one or all of these symptoms must have been apparent had dead bone been present. The personal history elicited revealed the fact that in early life the patient had had an accident which caused a fracture of the mandible in this locality. To this I attributed the unusual appearance of the bone.

The angle of incidence at which the ray

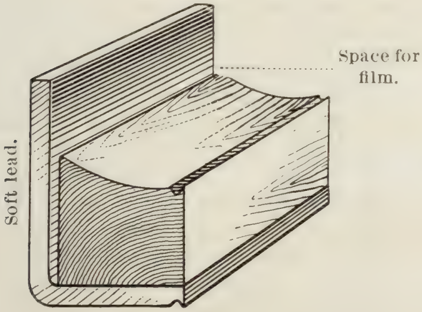
strikes a film in its relation to the tooth root has much to do with determining the real condition of the area radiographed. In one film there may be no indication of a rarefied area, while another exposure of the same area at a different angle shows positive evidence of an abscess. Resection of the roots of teeth often demonstrates a much larger abscess cavity than the radiograph indicates. This is due either to faulty exposure or to heavy overlying bone. These facts are mentioned to show the importance of the great care necessary in making exposures and the reading of radiographs, if correct conclusions are to be obtained. Many instances might be cited to show that one radiograph may give no indication of an abscess, when another taken at a different angle will show an abscess. Less dense or thin parts of bone, the inferior dental canal, the mental foramen, also the maxillary sinus, may at times deceive those not expert in reading films. Fake pictures resulting from defects in films have, in some instances, led to wrong conclusions. No one should make a positive diagnosis from radiographs alone. He should compare the pictures with the patient's jaw.—T. L. GILMER, *Dental Review*.

HINTS, QUERIES, AND COMMENTS

X-Ray Film-holder.

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—Herewith is a sketch of a film-holder for X-ray work. I find I can use it in almost all cases. It is really a wooden gag with lead fastened at the bottom and bent up at the back.



The film is placed between the lead and the wood, and held there by pressing the lead against it. When placed in position the patient bites on the wooden portion and so holds the film exactly where placed. I make them of various sizes and shapes.

ISADORE CLIFFORD.

London, Eng.

Sedative Paste for Temporary Stopping.

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—On page 840 of the August COSMOS Dr. Merritt describes the use of zinc oxid and oil of cloves made into the thickest possible paste as a temporary stopping with sedative qualities. This can be made even better by incorporating a quantity of cotton in the mix. It will then stand more wear. Everyone has noted the use of hair in building plaster; the cotton in the paste serves the same purpose as hair in the plaster.

I should mention that cotton incorporated in cement in this manner is claimed by some to help greatly in building out cement contour filling, using, however, only a few shreds of cotton in the cement.

AMOS G. STIKER, D.D.S.

Addison, N. Y.

DENTAL LEGISLATION
AND
LEGAL DECISIONS.

New Law Affecting the Practice of Dentistry within the State of New York.

CHAPTER 507 OF THE LAWS OF 1917.

A NEW law affecting the practice of dentistry in the State of New York was signed by Governor Whitman on May 16th. It is Chapter 507 of the Laws of 1917. It reads as follows:

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. Subdivision D of section two hundred and three of chapter forty-nine of the laws of nineteen hundred and nine, entitled "An act in relation to the public health, constituting chapter forty-five of the consolidated laws," as amended by chapter one hundred and twenty-nine of the laws of nineteen hundred and sixteen, is hereby amended to read as follows:

D. All courts of special sessions and police justices sitting as courts of special sessions shall have jurisdiction in the first instance to hear and determine all charges of misdemeanors mentioned in this article committed within their local jurisdiction, and to impose all the penalties provided for such misdemeanors; a judgment that the defendant pay a fine shall also direct that he be imprisoned until the fine be paid, specifying the extent of the imprisonment, which cannot exceed one day for every dollar of the fine imposed; provided, however, that the power of said courts and justices to hear and determine such charges shall be divested, if before the commencement of a trial before such court or justice a grand jury shall present an indictment against the accused person for the same offense, or if a justice of the supreme court or a county judge of the county shall grant a certificate, in the manner provided by law in cases of misdemeanor, that it is reasonable that such charge be prosecuted by indictment. Any misdemeanor mentioned in this article for which a punishment is not specifically imposed shall be punished by a fine of not more than five hundred dollars or by imprisonment for not more than one year, or both fine and imprisonment. [*]*Any person who shall violate any of the provisions of this article shall be subject to a penalty of one hundred dollars for each and every violation. Each act constituting a violation of this article shall be deemed to be a separate act, and the person guilty thereof shall be subject to a penalty of one hundred dollars for each such act. Where a violation consists of the unlawful practice of dentistry by a person, each day during which such unlawful practice continues shall constitute a separate violation and shall be subject to such penalty. Such penalties shall be recovered in an action brought therefor by the attorney-general in the supreme court in the county where the violation or any part thereof occurred. The provisions of the code*

[*The part printed in italics is new.]

of civil procedure and other laws relative to the recovery of penalties shall apply to actions brought for the recovery of penalties under this act. If judgment shall be recovered in an action brought for the recovery of such penalties, it shall be enforced by execution against the property and person of the judgment debtor, in the manner provided in the code of civil procedure. A right of action for the recovery of a penalty under this act may be settled or compromised by the attorney-general, either before or after proceedings are brought to recover such penalty and prior to the entry of judgment therefor. The penalties hereby imposed for a violation of the provisions of this article shall not in any way affect the liability of a person to punishment for a violation of this article upon prosecution therefor in a court of criminal jurisdiction. All prosecutions under this act shall be by the attorney-general in the name of the people of the State, and all fines may be paid to the board or sued for and recovered in the name of the people of the State in an action brought therefor by the attorney-general.

SEC. 2. This act shall take effect immediately.

State of Ohio: Opinion by the Attorney-general

ON THE

Right of Dentists to Administer Anesthetics.

AN opinion of special interest to dentists throughout Ohio was handed down by Attorney-general McGhee at the request of Dr. W. I. Jones of the State Health Council, who had requested it in order to clear up a very general misunderstanding.

In his opinion, Mr. McGhee holds that dentists who hold proper certificates are entitled to administer anesthetics both in the practice of dentistry and otherwise as occasion may arise.

Some time ago an opinion, which was popularly construed to confine such service to doctors of medicine, was given out.

To quote all the law bearing on the subject, Attorney-general McGhee says:

OPINION.

I advise you that a person who has a certificate to practice dentistry in the State of Ohio is permitted to administer anesthetics, not only in the exclusive practice of dentistry, but also when otherwise properly required to do so.

In Opinion No. 528, rendered by me on August 14, 1917, I held that the giving of the various drugs to produce anesthesia, when surgical operations are being performed, constitutes the practice of medicine under the provisions of the medical laws of this state, and therefore could not be given by persons not admitted to the practice of medicine; but the question raised in this opinion as to the exemption of a dentist was not before me, and was not answered in that opinion.

DENTAL COLLEGE COMMENCEMENTS

University of Minnesota, College of Dentistry.

THE forty-fifth annual commencement exercises of the University of Minnesota, College of Dentistry, were held in Minneapolis, Minn., on June 14, 1917.

An address was delivered by T. G. Soares, Ph.D., D.D.

The degree of Doctor of Dental Surgery was conferred by the president, G. E. Vincent, Ph.D., LL.D., on the following graduates:

Walter J. Abell	Minnesota
Leroy C. Andersen	Minnesota
Louis Bergersen	Minnesota
Ingvald G. Bergh	Minnesota
Jacob V. Birnberg	Minnesota
August T. Bodien	Minnesota
Abe Borovsky	Minnesota
Frank T. Brink	Minnesota
Erwin F. Bruss	Minnesota
John E. Buehler	Minnesota
David R. Chisholm	Minnesota
Michael J. Cohler	Minnesota
Daniel N. Colburn	Minnesota
John E. Connell	Wisconsin
George W. Cook	Minnesota
Beatrice E. Danz	Minnesota
Hymen A. Diamond	Minnesota
Laurence M. Durfee	Minnesota
Stanley M. Farrell	Washington
Graham B. Fee	Wisconsin
Edgar A. Fossum	Minnesota
Leonard C. Gabrielson	Minnesota
Herbert E. Gardner	Minnesota
Donald Geddes	Minnesota
Magnus Gerde	Minnesota
Cecil W. Girvin	Minnesota
Arthur P. Hansen	Minnesota
Elmer L. Hanson	Minnesota
Frederick W. Harper	North Dakota
Rolf P. J. Hartig	Minnesota
Joseph I. Hartwig	Minnesota
Walter K. Haven	Minnesota
Clifford J. Healy	Minnesota
Lambert M. Hendricks	Minnesota
Max R. Herrmann	Minnesota
Harold C. Hillmann	Minnesota
Herbert A. Hoglund	Minnesota
Houghton Holliday	Minnesota
Walter G. Iverson	Minnesota
Roy M. Jernall	Minnesota
Roy Johnson	Minnesota
Dagny I. Just	Minnesota
Edward J. Kubesh	Minnesota
Emmet G. Leighton	Minnesota
Ray B. LeMay	Washington
Clarence Lillehei	Minnesota
Clifford O. Lindelien	Minnesota
Robert W. Linquist	Minnesota
Morell D. McKenzie	Minnesota
Richard Meintsma	Minnesota
Melvin A. Miller	Minnesota
Clarence A. Nelson	Wisconsin
Alfred Olson	Minnesota
Charles H. Paske	Pennsylvania
Chester Peterson	Minnesota
Walter F. Peterson	Minnesota
Roy H. Pfeiffer	Minnesota
Linus L. Pierson	Minnesota
Leon M. Radke	Minnesota
William L. Radke	North Dakota
Henry N. Reinking	Minnesota
William D. Reynolds, Jr.	Minnesota
George H. Ribbel	Minnesota
George M. Ringstrom	Minnesota
John F. Robinson	Minnesota
John G. Saevig	Minnesota
Adolph F. Schuft	Minnesota
Charles A. Sell	Minnesota
Harold O. Shackell	Minnesota
Raymond F. Shanahan	Minnesota
August E. Simonson	Minnesota
Arthur E. Skon	Minnesota
Marion R. Stevens	Minnesota
Clayton A. Swanson	Minnesota
Ingeborg Talle	Minnesota
Marcus H. Thorson	Minnesota
Charles M. Tucker	Minnesota
Clarence A. Tucker	Minnesota
Arthur C. Wedin	Minnesota
Christian J. Weibeler	Minnesota
Harry L. Weisman	Minnesota
Lehman Wendell	Minnesota
Earl C. West	Minnesota
Vernon D. Whitaker	Minnesota
Eleonora S. White	Minnesota
Floyd M. White	Minnesota
Oliver P. Wilson	Minnesota
Amadeus F. Wolter	Minnesota
Walter W. Zettler	Minnesota
Daniel E. Ziskin	Minnesota

Ohio College of Dental Surgery.

The seventy-first annual commencement exercises of the Ohio College of Dental Surgery were held at the Odeon, Cincinnati, Ohio, June 1, 1917.

Addresses were delivered by Prof. H. T. Smith, dean, Prof. N. S. Hoff, and James T. C. Kemper, D.D.S.

The degree of Doctor of Dental Surgery was conferred by Chas. I. Keely, D.D.S., president, on the following graduates:

William R. Adams	Massachusetts
Alfred J. Bailey	New York
Harry E. Bailey	West Virginia
Blanchard E. Baldridge	Ohio
Constantino Barletta-Paz	Porto Rico
Don E. Chase	Ohio
M. Francis Cullinan	Pennsylvania
Nial E. Ferris	Ohio
J. Ford Gawthrop	West Virginia
Charles B. Hall	Kentucky
Ray Houchins	West Virginia
Gerald V. Howard	Ohio
H. Raymond Hunter	West Virginia
Walter G. Ireland	Ohio
James T. C. Kemper	West Virginia
Edwin J. Knaus	West Virginia
M. Raye Knox	Ohio
Harold M. Krapp	Ohio
Edward J. Lynett	Pennsylvania
Bernard McDonald	Ohio
Rachel McKee	West Virginia
Michael A. Makahusz	Ohio
David F. Mayne	Ohio
Terrence C. Moorefield	West Virginia
P. José Mora	Central America
Motter C. Pennypacker	Ohio
Gaver M. Powers	West Virginia
Mafford P. Rohr	West Virginia
Benjamin Schiff	Ohio
E. Frank Sharp	West Virginia
Charles R. Singleton	West Virginia
Vaught Smith	West Virginia
R. Kirtley Stephenson	Ohio
Ruth W. Walton	Ohio

Louisville College of Dentistry.

At the annual commencement exercises of Louisville College of Dentistry, held in Louisville, Ky., on June 3, 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Alvin L. Acker	Tennessee
Charles S. Adelstein	Ohio
Forest L. Arnold	Kentucky
Meyer L. Axelrod	Ohio
Wesley A. Bridwell	Iowa
Adrian Back	Kentucky
Ervin F. Bence	Indiana
Chas. N. Brosey	Illinois
James J. Call	Illinois
Hal O. Cowles	Montana
Kenneth M. Crow	Canada
Henry J. Comley	Kentucky
Finnie E. Crawford	Kentucky
Jamie S. Dailey	Kentucky
J. N. Daniel	Indiana
Walter L. Davenport	Arkansas
Thomas W. Deyton	North Carolina
Ivington V. Duell	Kentucky
William L. Edelen	Texas
Clenet R. Ellis	Kentucky
Samuel N. Farkes	Ohio
James H. Fullenwider	Kentucky
Bruce C. Funk	Indiana
William H. Grant	Kentucky
Walter G. Gross	South Dakota
Charles V. Gallimore	Tennessee
Monroe C. Haase	Ohio
Harry G. Hazelrigg	Kentucky
Gay S. Hildreth	West Virginia
Kennie H. Justice	Kentucky
James H. Kemper	Kentucky
Oswell W. Lilly	West Virginia
Julian M. Logsdon	Kentucky
Ollie M. Lyon	Kentucky
Charles P. Mayhall	Kentucky
Creston C. Mayhall	Kentucky
Edgar J. Moore	Kentucky
Roy H. McCarthy	Washington
Neil J. McCollum	Illinois
Cecil W. McKechnie	Canada
Leo P. McNeeley	Ohio
Clifford R. McWethy	Indiana
Stacey H. Noyes	Maine
John T. O'Rourke	Maine
J. C. Overby	Kentucky
James T. Peay	Arkansas
Clyde L. Penney	Maine
Andrew J. Rogers	Missouri
Henry L. Sinclair	Kentucky
Elbert Skaggs	Kentucky
Thomas J. Speers	Kentucky
Robert L. Sprau	Kentucky
Harry E. Staton	Indiana
Archie W. Stewart	North Dakota
Cecil D. Stewart	North Dakota
Harry Taylor	Ohio
William O. Trueb	Indiana
Louis A. Wachs	Ohio
Hal B. Washburn	Kentucky
Leland R. White	Arizona

Lincoln Dental College.

THE seventeenth annual commencement exercises of Lincoln Dental College were held in Lincoln, Nebr., on June 2, 1917.

An address was delivered by Rev. T. W. Jeffrey.

The degree of Doctor of Oral Surgery was conferred by the dean, Dr. Clyde Davis, on the following graduates:

Joyce H. Abbott
Francis W. Albrecht
John R. Bennett
George W. Burgess
Millard U. Burton
Ivan N. Carr
Adelmer B. Chaloupka
James R. Chappell
William E. Chappell
Harold C. Cook
James I. Davis
Donald D. Donovan
Richard W. Donovan
Lloyd N. Harlow
Eric G. Hoylman
Martin W. Jenkins
Roy P. Johnson
James F. Johnston
Benjamin E. Krajicek
Warren E. MacGregor
Curtiss S. McCallister
Edward C. Marx, Jr.
Lawrence W. Moore
Arthur E. Olson
Laurence M. Peterson
Fritz A. Pierson
James F. Purney
Donovan P. Quimby
Elbert C. Rohrbacher
Archibald B. Sturdevant
John W. Thompson
Harry D. Webster
Arthur E. Wood
Edwin B. Zwink
William A. Zwink

Colorado College of Dental Surgery.

THE commencement exercises of Colorado College of Dental Surgery were held in Denver, Colo., on June 7, 1917.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Ernest E. Beal
Joseph E. Beal
John C. Bibbs
Fred G. Bowden
Ronald A. Bown
Herbert L. Bunker
Henry H. Collins
Harold V. Crawford
Harold J. Davis
Justin F. Day
Roy B. Dean
Henry J. Dehmer
Andrew J. Dooner
Timothy J. Drew
Hymen E. Dveirin
Lawrence T. Elofson
Lorin S. Fimple
Bayard L. Fowler
George L. Gilbert
Robert L. Gray
Harry W. Griffith
Henry G. Hansen
Thomas J. Hooper
Guy E. Jones
Loren C. Jones
James M. Keegan
Lucius S. Kemp
Albert A. Lamden
Charles P. Laurino
Robert H. McBride
Harry C. Miller
Charles L. Milton
Carlton I. Monson
Joseph H. Reed
John N. Schwab
Albert L. Schwalb
William M. Shapiro
Franklin M. Smolenske
Harry M. Steever
Raymond R. Steinhart
George W. Toby
Adolph A. Unfug
Henry H. Valentine
Lee W. Whitaker

Howard University, Dental College.

AT the annual commencement exercises of the Howard University Dental College, held in Washington, D. C., in June 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Richmond N. Bailey	Virginia
George S. Barnes	Maryland
Ulysses G. Benson	South Carolina
Russell L. Bowser	North Carolina
James S. Cardwell	West Virginia
Nina K. Christopher	Florida
Charles H. Coleman	Virginia
Frederick C. Cooke	North Carolina
Leon H. Cork	Delaware
Vernon F. Crosbie	Panama
Dillard J. Firse	Ohio
Sandy T. Franklin	Tennessee
James M. Gumbs	British West Indies
Robert J. Hackett	Maryland
John H. Hayes	New Jersey
Walter N. Hibbert	British West Indies
Percy S. Holden	North Carolina
Woody L. Horne	North Carolina
Oliver L. Lattimore	Texas
Wesley S. Lockley	North Carolina
Oliver W. H. McNeill	District of Columbia
Rembert T. Nelson	Texas
Carl H. Norton	Florida
James T. Parham	Virginia
James B. Parks	South Carolina
Mark E. Rivers	District of Columbia
Blaine W. G. Ross	Virginia
Herbert C. Samuels	British West Indies
Alphonso D. Stone	Alabama
Hulett C. Strothers	Pennsylvania
Royal W. Taylor	Virginia
Ralph B. Teabeau	Iowa
Charles R. Van Leesten	British Guiana
Alice M. Watkins	Alabama
William H. Williams	North Carolina
Virgilio M. Zuazo	Cuba

University of Maryland, Dental Department.

At the annual commencement exercises of the University of Maryland, Dental Department, held in June 1917, in Baltimore, Md., the degree of Doctor of Dental Surgery was conferred on the following graduates:

Milton B. Acorn	Washington
Louis A. Bennett	Virginia
Edwin M. Betts	New Jersey
Coleman T. Brown	Florida
Charles H. Claiborne, Jr.	Maryland
James C. Clarke	Virginia
Carl P. Cline	Virginia
Emsley A. Coble	North Carolina
Maurice D. Corrigan	Connecticut
Morris Cramer	Maryland
Oscar E. Culler	North Carolina
Emmett P. Dagon	New York
Lawrence A. Demarco	Maryland
George A. Dozois	New Hampshire
Z. Lester Edwards	North Carolina
J. Frederick Emerson	Brazil
Cornelius B. Fish	New York
Glenn B. Fleek	New York
Owen P. Gillick	New York
Frank J. Glanville	New Jersey
Joseph J. Godson	New York
Charles L. Goldberg	New York
Walter H. Harnisch	New York
Harold I. Huckans	New York
Joaquin Jimenez-Matutez	Porto Rico
Albert H. Kendall	Georgia
Moe M. Kirshen	New York
DeWitt B. Lancaster	South Carolina
J. Frank Manley	Massachusetts
Adolphe N. Marsh	Massachusetts
Leland H. Miller	Maine
Harold W. Ouderkirk	New York
Eldorus H. Palmer	New York
John F. Peters	Central America
Glenn H. Quick	New York
Harold B. Sampson	New York
Ramon F. Sabater	New Jersey
Pierre J. Santoni	Porto Rico
Roy P. Smith	Maryland
Durward L. Tracy	Vermont
Victoriano A. Vina	Cuba
George E. Waynick	North Carolina
Boris Wechteren	Russia
William G. Williams	Connecticut
L. Clarke Witten	West Virginia
Earl R. Wray	New York

Ohio State University, College of Dentistry.

The fortieth annual commencement exercises of Ohio State University, College of Dentistry, were held on June 5, 1917, in Columbus, Ohio.

An address was delivered by Harry B. Hutchins, LL.D.

The degree of Doctor of Dental Surgery was conferred on the following graduates:

Otto F. Apel	Ohio
John A. Bailey	Ohio
Clarence F. Berry	Ohio
Elmer J. Billman	Ohio
Walter E. Brehm	Ohio
Henry J. Burgoon	Ohio
Cadie V. Busch	Ohio
William B. Caldwell	Ohio
Hollis L. Coblentz	Ohio
Harry T. Coffman	Ohio
Edward N. Cook	Ohio
Rozelle M. Cope	Ohio
Harry Van Denzer	Ohio
Harley J. Dickey	Ohio
Lester L. Dull	Ohio
Wilbur S. Early	Ohio
Edwin D. Fletcher	Ohio
Vassar G. Gaut	Ohio
Edwin F. Gowdy	Ohio
Ralph W. Green	Ohio
Lazarus L. Greenblum	Russia
Edward J. Gromme	Ohio
Loren E. Hart	Ohio
Paul N. Hedrick	Ohio
Arthur C. Heibert	Illinois
Robert J. Higgins	Ohio
Isaac E. Jones	Ohio
Joseph H. Jones	Ohio
Walter A. Knoderer	Ohio
Earl D. Lowry	Ohio
Burton McCroba	Ohio
Pauline McDonald	Ohio
Walter J. McFarren	Ohio
James M. Powers	Ohio
Walter A. Rose	Ohio
Walter E. Schoeneweiss	Ohio
William O. Semans	Ohio
Harold D. Sharp	Ohio
Thomas J. Smith	Ohio
Floyd E. Stamp	Michigan
John O. Steer	Ohio
Leland V. Walton	Ohio
Glen A. Wilson	Ohio

University of Pittsburgh, School of Dentistry.

At the annual commencement exercises of the University of Pittsburgh, School of Dentistry, held in Pittsburgh, on June 13, 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Walter L. Alexander
Olly C. Ammons
Albert L. Bartlett
Shanor R. Blythe
Thurlow W. Brand
Arthur E. Brown
James M. Burwell
Lawrence F. Campbell
Joseph H. Cole
Ralph McN. Crawford
Paul M. Cumings
Russell P. Custer
Franklin A. Dias
Walter H. Donnellan
Ellsworth E. Eskey
Ward W. Eskey
Harry R. Forney
Robert F. Fox
Samuel Friedlander
Robert R. Galen
L. K. Garis
Carl R. Garman
Earl L. Geisel
John M. Goehring
Edwin E. Graham
Gabriel F. Gurley
DeWitt Hall
William F. Hancuff
Samuel S. Haudenshield
Thomas F. Healy
William L. Inskeep
Ethel W. Jacobson
Doss T. James
Paul N. Jordan
Homer E. Kimmel
George McC. Kiner
Maurice G. Lafferty
Mark I. Leadbetter
Abraham Levendorf
Alvie R. Livermore, Jr.
Howard R. Ludwig
Raymond C. Lutz
James W. Lynam
John B. Lyon
William E. McCain
James C. McNeill
James F. McQuistion
Joseph S. Matson
Edward C. Mault
George W. Megahan
Herman Meyers
Robert B. Mowry
James M. Mullen
Nathaniel W. Neft
Paul T. Nelson
Clarence M. Orr
Ray W. Osborn
Oscar J. Reckard
Roland D. Redmond
Edwin J. Reichel
Joseph E. Remlinger
Harry R. Reynolds
Perley H. Richardson
George A. W. Rigg
Elmer R. Robb
Ashby C. Robinson
Edmund L. Rogers
Victor E. Schermerhorn
Ninon A. Shaw
John W. R. Sheehan
Maurice A. Showalter
William S. Shuttleworth
A. Allison Spielberg
Henry A. Stahlman
James G. Steiner
Russell L. Stevens
Palmer J. Sullivan
Perry Swanson
Paul Trnavsky, Jr.
Roy W. Walters
Stanley G. Williams
Max Wingerd
Walter H. Wright
Percy P. Yohe

Harvard Dental School.

At the annual commencement exercises of Harvard Dental School, held in Cambridge, Mass., on June 21, 1917, the degree of Doctor of Dental Medicine was conferred on the following graduates:

Alberto Amado	Portugal
Clifford H. Atwood	New York
Wm. E. Bennett	Australia
Lloyd H. Blanchard	Massachusetts
Louis E. Blumberg	New York
Edmund J. Bolan	Massachusetts
Wm. Breslow	Massachusetts
Leon R. Briggs	Rhode Island
Adrian P. Brodeur	Massachusetts
Herman Brody	Connecticut
Harold A. Carnes	Massachusetts
Lewis A. Cowen	Massachusetts
Faber W. Croll	Massachusetts
Francis P. Devlin	Massachusetts
Moses J. Eisenberg	Massachusetts
Arthur W. Elworthy	Australia
Carl H. Ernlund	Sweden
Herbert L. Esterberg	Massachusetts
John A. Fernald	Rhode Island
Samuel Fine	Massachusetts
Joseph T. Finn	Massachusetts
Roland E. Fletcher	Maine
Charles P. Fortin	Massachusetts
Benj. Goldinger	Massachusetts
Selig I. Grover	Massachusetts
Edward C. Hoey	Massachusetts
Lanson J. Hyde	New Hampshire
Rupert I. Irving	New Brunswick
Philip I. Johnson	Massachusetts
Wm. J. Kenefick	Massachusetts
Frank E. Kunker	New York
Harold F. LaFayette	Massachusetts
Raymond W. Libby	New Hampshire
Ryerson P. Long	New Brunswick
Alister I. McIver	Rhode Island
Harold K. MacDonald	Massachusetts
Louis C. Midwood	Rhode Island
Sigmund Miller	Massachusetts
Leonard D. Nathan	Australia
Warren B. Perry	Massachusetts
Russell S. Phillips	Massachusetts
Frank A. Reiser	Connecticut
Abraham Sagoff	Massachusetts
Mitchell S. Selib	Massachusetts
Max Sharpe	Massachusetts
Clifton A. H. Smith	Vermont
Richard B. Smith	Massachusetts
Fred F. Sproat	Massachusetts
Herbert A. Sturtevant	Massachusetts
Ralph M. Towle	Maine
Alphonso M. Vercueil	South Africa

Washington University.

At the annual commencement exercises of Washington University, held in St. Louis, Mo., on Thursday, June 14, 1917, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Clarence W. Adams
Wendell A. Anthony
Thomas L. Barnidge
Everett W. Bedell
Herbert V. Blount
Alfred H. Caffee
James E. Caldwell
Carlisle Carson
Jesse L. Coats
Forest W. Cone
Fred L. Edele
Faris C. Elzea
Walter J. Faber
John M. Fleming
Edward T. Gallagher
Earl N. Henderson
Leonard J. Hitz
Robert L. Howell
Albert J. Jacobsmeyer
William P. Katz
Charles R. Logan
Roy L. Martin
Clifford G. Maxwell
Porter H. Miller
Carroll L. Moore
Fayette D. Pendleton
Edgar B. Ratliff
Geneve G. Riefling
Louis H. Renfrow
Amos H. Rode
Barbey M. Russell
Harry R. Shanley
George R. Taylor
Oswald W. Thumser
Gustav H. Volmer
George S. Westfall
Walter L. White
Otto A. Wiegreffe
Jackson T. Yates

Indiana Dental College.

The annual commencement exercises of Indiana Dental College were held in Indianapolis, Ind., on June 14, 1917.

An address was delivered by Dr. Chas. P. Emerson.

The degree of Doctor of Dental Surgery was conferred by Dr. John N. Hurty, president of the board of trustees, on the following graduates:

Ernest A. Baecher
Ferdinand G. Behmlander
William G. Brauchla
Harry Bryant
George Carberry
Clatus L. Cope
John T. Cosler
George H. Crusius
Watson E. Deakyne
Francis J. D'Enbeau
John Devin, Jr.
Roger L. Dill
John R. Donagh
Royal A. Eddy
Walter C. Eickhoff
Roy S. Ellsworth
Lawrence S. Fall
Edwin T. Foster
Andrew R. Filak
Carl A. Frech
Gale Friday
Melvin B. Gans
Clarence E. Guedel
Neal R. Gunn
Wayne O. Hill
Sidney C. Hoffman
Herbert J. Hoppensack
Opal I. Jackson
Chester W. Jones
Homer W. Jones
Charles J. Kramer
Fred W. Leavell
Jean P. Lieb
Smith Little
Audria E. Long
Fred McNaughton
Paul W. Mann
William A. Meyer
William G. Miller
Paul G. Miller
W. Lozier Milstead
William J. Mooney
Eugene F. Norman
Harold C. Percival
Ludwic E. Peterson
Earl M. Ramsey
Cecil O. Richer
Robert B. Rutherford
Morton L. Sarter
Ray S. Sensanbaugher
Raymond G. Shepard
Glenn A. Showerman
Carl Shreve
Lewis B. Spear
Claude Spencer
Jay Spink
Wilbur E. Spitler
Clement C. Sullivan
Marion F. Sullivan
Ralph W. Thompson
Edgar Welsh
Noah A. Whaley
Paul E. Williams

University of Illinois, College of Dentistry.

At the annual commencement exercises of the University of Illinois, College of Dentistry, the degree of Doctor of Dental Surgery was conferred on the following graduates:

Sanford Anderman	Illinois
Martin R. Anderson	Illinois
William G. Baird	Oregon
Edgar G. Beane	Pennsylvania
Cecil R. Conroy	Illinois
John L. Dolson	Michigan
Egner A. Eklund	Ohio
John H. Felz	Illinois
Harry V. Franklin	Iowa
Charles F. Franzwa	Wisconsin
Lee C. Hibbard	Illinois
Dean E. Ihde	Wisconsin
Joseph E. Jaros	Illinois
Frank A. Jarrett	Illinois
Hiroshi Kawamura	Japan
Kenneth M. Kern	Ohio
Wauclau H. Kubacki	Illinois
Carl Lee	Wisconsin
Richard G. Lincoln	Illinois
Harral R. Johnson	Illinois
James D. Mershimer	Illinois
James L. McClurkin	Pennsylvania
Charles A. Nemecek	Illinois
John M. Oelschlager	Ohio
Theodore C. Ostrowski	Illinois
Edward A. Rubin	Illinois
Albert F. Schiltz	Iowa
Paul J. Secrest	Illinois
Victor J. Shalek	Illinois
Robert I. Sherman	Illinois
Burne O. Sippy	Illinois
Barnett Q. Smith	Missouri
Lee A. Tark	Illinois
Leslie G. White	Illinois
Harry Winsberg	Illinois
George L. Weir	Illinois
William B. Wynkoop	Michigan
John F. Wilson	Illinois

University of Michigan, College of Dental Surgery.

At the annual commencement exercises of the University of Michigan, College of Dental Surgery, held in Ann Arbor, Mich., the degree of Doctor of Dental Surgery was conferred on the following graduates:

John Abele	New York
Arthur F. Anderson	Michigan
Oliver C. Applegate	Michigan
Charles A. Baribeau	Michigan
Clarence R. Barron	Michigan
David J. Bittker	Michigan
Roy Bixby	Michigan
Clarence J. Bott	New York
Arsen M. Boyajian	Michigan
Grover C. Brockman	Michigan
John G. Brodie	Canada
Ned D. L. Brown	Michigan
Stephens J. Brown	Michigan
George A. Brown	Michigan
Henry E. Brunner	Michigan
Harold K. Burch	Colorado
Richard H. Burkhart	New York
Horace B. Burr	Indiana
Arthur B. Campbell	Michigan
George W. Christiansen	Michigan
Edward A. Collacott	Michigan
George A. Cronk	Michigan
Paul S. Crosby	Michigan
Frederick W. Dean	Michigan
Floyd H. DeCamp	Idaho
Edward D. Ettinger	Michigan
Claude L. Evans	Michigan
Henry B. Felton	New York
Leo O. Finch	Michigan
Frederick C. Frank	Michigan
Robert McK. Gardner	Michigan
Frederick Gerbstadt	Michigan
Otha E. Getts	Michigan
Ross T. Getty	Michigan
Paul J. Glugla	Wisconsin
Hilliard W. Goldstick	Michigan
Neil D. Gotschall	Michigan
Glen A. Graham	Michigan
Donald S. Graham	Michigan
Carl P. Griesmer	Pennsylvania
Edwin E. Guerrier	Michigan
Arthur E. Hammond	Michigan
Carl G. Handshaw	Michigan
Arthur S. Harrison	Michigan
Harry J. Herrick	Michigan
John A. Hickey	Michigan
John M. Hopkins	Michigan
Dorothea A. Howes	New York
Charles E. Hubbard	Michigan
Clare C. Hugan	Michigan
John H. Hughes	Michigan
Ernest V. Hughes	Michigan
William P. Hulett	New York
Jesse P. Jaxtimer	Pennsylvania
Edward N. Kellogg	Michigan
John W. Kemper	Indiana
Harry Kohn	Michigan
Treverton E. Lewis	Pennsylvania
Clarence L. Loew	Michigan
Caryl I. Malcomson	Michigan
Clifton G. Maree	Michigan
William R. Milner	Canada
Lewis H. Morrison	Michigan
Edward Mulder	Michigan
Charles T. Murphy	Michigan
John D. Murphy	Michigan
James G. Murray	Michigan
Daniel B. Newton	New York
James E. Oberlin	Ohio
Winfield S. Osborn	Michigan
John R. Pear	Michigan
Guy D. Peters	Canada
Fenimore E. Putt	Michigan
Walter J. Reason	Michigan
Albert J. Richards	Michigan
Richard A. Roelofs	Michigan
Albert J. Schmutzler	Ohio
Stanley J. Slazinski	Michigan
Walter B. Steele	Michigan
Ray E. Stevens	Michigan
Bertrand C. Styles	Georgia
Otis L. Sutherland	Michigan
Lester M. Sanderson	Michigan
Ward J. Taphouse	Michigan
Richard H. Tremper	Michigan
Frederick W. Trigg	Michigan
Harold A. Truesdell	Kansas
Max L. Weny	Michigan
Joseph Wilson	New York
Maurice L. Wood	Michigan
Harry B. Wright	Michigan

SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS not later than the 11th or 12th of the month preceding that of publication.

[NEW YORK CITY.]

National Association of Dental Faculties.

THE 1917 meeting of the National Association of Dental Faculties will be held at the Hotel Astor, New York City, Friday and Saturday, October 19 and 20, 1917.

The Executive Committee will meet at 9 A.M., and the general session will open at 10 o'clock as usual.

CHAS. CHANNING ALLEN, *Sec'y,*
N. W. cor. 10th and Troost, Kansas City, Mo.

[NEW YORK CITY.]

Association of Military Dental Surgeons.

THE annual meeting of the Association of Military Dental Surgeons of the United States will be held at Hotel Astor, New York City, October 23 to 26, 1917.

J. D. MILLIKIN, *President,*
S. W. HUSSEY, *Sec'y.*

[NEW YORK CITY.]

Delta Sigma Delta Fraternity.

THE thirty-third annual meeting of the Supreme Chapter of Delta Sigma Delta Fraternity will be held in the East ballroom of the Hotel Astor, New York City, Monday, October 22, 1917, at 10 A.M.

The regular order of business will be pursued, to be followed by initiatory exercises in the afternoon.

The headquarters of the Fraternity will be at the same hotel, at which place the annual banquet will be held at 7 P.M. in the North ballroom.

By order of the Supreme Chapter.

R. OTTOLENGUI, *Supreme Grand Master,*
R. HAMILL D. SWING, *Supreme Scribe.*

[NEW YORK CITY.]

Xi Psi Phi Fraternity.

THE alumni of the Xi Psi Phi Fraternity will hold a dinner at the Waldorf-Astoria Hotel, New York City, on October 22, 1917.

All the alumni of the fraternity are most cordially invited to attend. For particulars write

J. NOHERT GELSON,
282 Park Place, Brooklyn, N. Y.

[NEW YORK CITY.]

Psi Omega Fraternity.

ALL members of Psi Omega attending the National Dental Association will find headquarters provided at the Hotel Astor during the week of the convention. Please register *immediately* upon arrival.

The annual meeting and banquet of the Fraternity will be held at the Hotel Astor, Friday evening, October 26, 1917.

H. M. POTTER, *Sec'y,*
Reception Com.

Iowa State Dental Society, Northwestern District.

THE annual meeting of the Northwestern District of the Iowa State Dental Society will be held at the Martin Hotel, Sioux City, Iowa, October 2 and 3, 1917.

C. E. WESTWOOD, *Sec'y,*
Sioux City, Iowa.

Rhode Island Dental Society.

THE regular quarterly meeting of the Rhode Island Dental Society will be held in Providence, on October 19, 1917.

Members of all state societies are cordially welcomed.

CHAS. J. SMITH, *Sec'y,*
315 Butler Exchange, Providence, R. I.

NATIONAL DENTAL ASSOCIATION ANNOUNCEMENTS

ALL MEETINGS, CLINICS (EXCEPT SURGICAL), AND EXHIBITS, TO BE IN HOTEL ASTOR.

Twenty-first Annual Meeting, New York City, October 22-26, 1917.

THE following are additions to the program as already published:

Monday, October 22d.

(Registration: Laurel room, first floor.)

BOARD OF TRUSTEES (first session), 11 A.M.

HOUSE OF DELEGATES (opening), 2 P.M.

BOARD OF TRUSTEES (second session), 4 P.M.

First General Session.

Tuesday, October 23d, 9 a.m.

Invocation.

Address of welcome—Gov. Chas. S. Whitman, Albany, N. Y.

Mayor John P. Mitchel (on behalf of City), New York City.

President's Address—LaFayette L. Barber, Toledo, O.

Oration—E. C. Rosenow, M.D., Rochester, Minn., a research member of the Memorial Institute for Infectious Diseases, Chicago, and Professor of Experimental Bacteriology, Univ. Minnesota, and the Mayo Institute.

Second General Session.

Tuesday, October 23d, 8 p.m.

RESEARCH DEPARTMENT: PATHOLOGICAL, BACTERIOLOGICAL, AND CLINICAL STUDIES.

"Dental Caries." Russell W. Bunting and U. G. Rickert, B.S., M.A. (Work done in and with the assistance of the Univ. Michigan.)

"A Study of the Pathology of the Peridental Membrane." Frederick B. Noyes. (Work done in and with the assistance of the University of Illinois.)

"The Histo-pathology of Chronic Periodontitis and the Pathogenesis of Dental Rootcysts." Thos. B. Hartzell and Arthur T. Henrici, M.D. (Work done in and with the assistance of the University of Minnesota.)

"A Comparative Study of Oral Focal Infections." Weston A. Price and Milton J. Damlos, D.D.S., Research Institute Laboratories, Cleveland, Ohio.

Third General Session.

Wednesday, October 24th, 8 p.m.

Herbert L. Wheeler, *Chairman*, New York.

DENTAL SURGERY AND RESTORATIVE PROSTHESES IN THE EUROPEAN WAR.

"War Dental Surgery."

"War Dental Restorative Prostheses."

It is expected that Mr. Robert Bacon, ex-ambassador to France, will preside, and that the Surgeons-general of both the army and navy will attend. A description of the work done in Europe will be given by one who has had experience there.

It is anticipated that both the medical and dental professions will be represented.

There will also be pictures of "War Surgery."

Fourth General Session.

Thursday, October 25th, 8 p.m.

Chas. H. Oakman, *Chairman*, Detroit, Mich.

ORAL AND DENTAL HYGIENE—MASS MEETING.

"The Importance of Dental Infections as Related to Urinary Tract Diseases, with Particular Reference to Ureter Stricture and Its Sequelæ." Guy L. Hunner, S.B., M.D., Johns Hopkins Univ., Baltimore, Md.

Research Department.

Wednesday, October 24th, 1.30 p.m.

"Root Canal Fillings." John R. Callahan. (Work done in and with the assistance of the Cincinnati General Hospital.)

"Studies upon the Bacteriology of Dental Caries." Percy R. Howe. (Work done in and with the assistance of the Forsyth Dental Infirmary.)

"Quantitative Determinations of Certain Organic Substances in Saliva, and their Relations to Oral Conditions." John A. Marshall, M.S., D.D.S. (Work done in and with the assistance of the University of California.)

"Electrolytic Medication—Physiological and Dental Aspects." Samuel E. Pond, B.H., A.M., and Weston A. Price, Research Inst. Laboratories, Cleveland, Ohio.

Thursday, October 25th, 9 a.m.

CHEMICAL AND METALLURGICAL STUDIES.

"Dental Cements." Marcus L. Ward. (Work done in and with the assistance of the University of Michigan.)

"Progress of the Investigation of Mottled Enamel." Frederick S. McKay, Colorado Springs, Colo.

"Studies of Internal Secretions in Their Relation to the Development and Condition of the Teeth." W. J. Gies, M.D. Ph.D. (Work done in and with the assistance of Columbia University, New York City.)

"The Relative Efficiency of Medicaments for the Sterilization of Tooth Structures." Matilda Moldenhauer, A.B., M.S., and Weston A. Price, Research Inst. Laboratories, Cleveland, Ohio.

Preparedness League of American Dentists.

Tuesday, October 23d, 1.30 p.m.

"The Relations of the Dental to the Medical Corps of the Army." Victor C. Vaughan, M.D., ex-president of the American Medical Association, member General Medical Board, Council National Defense, Washington, D. C.

"The Value of the Educational Work Effected by the Preparedness League of American Dentists." Frank M. Casto, Cleveland, Ohio.

"Report of Sectional Units of the League by States—A to M inclusive."

Thursday, October 25th, 1.30 p.m.

"Stereopticon Lecture on Fractures of the Bones of the Face." Synopsis: This lecture will include the consideration and treatment of gunshot wounds; removing foreign substances; the sterilization of wounds; the proper adjustment of fragments and the means employed to immobilize them. (In the treatment of injuries of the face, the primary step should be after removing foreign substances to establish, as nearly as possible, asepsis.) The use of grafts of bone, modeling compound, hard rubber, and metals to replace lost parts.

"The Dental Ambulance in War." George B. Hayes, Neuilly (Paris), France.

"Report of Sectional Units by States—N to Z inclusive."

(An interesting Preparedness Exhibit will be shown, including Dental Ambulances, Base Hospital, Field Hospital, and First Aid Equipments; in fact, everything relative to the service of the Officers Reserve Corps, Dental Section, and Red Cross. Officers will be present to give instruction and information. The ambulances shown are to be sent to France as the gift of members of the Preparedness League and appreciative patients.)

Anesthetists Section.

Wednesday, October 24th, 1.30 p.m.

"The Teaching of Local Anesthesia." Theo. Blum, New York City.

"The Relative Toxicity of Local Anesthetics." George B. Roth, Washington, D. C.

"Cause of Failure and Untoward Sequelæ in Conductive Anesthesia." Richard H. Riethmüller, Montclair, N. J. (Illustrated by moving picture film.)

Thursday, October 25th, 9 a.m.

"After-pain in Local and General Anesthesia." A. E. Hertzler, Kansas City, Mo.

"General Anesthesia for Oral Surgery." Herbert A. Potts, Chicago, Ill.

State Society Officers Section.

Wednesday, October 24th, 9 a.m.

"Postgraduate Course." B. L. Shobe, Tulsa, Okla.

"State Legislation from a Dental Standpoint." A. H. Reynolds, Philadelphia, Pa.

"Taking an Invoice of Our State Societies." Otto U. King, Huntington, Ind.

Wednesday, October 24th, 1.30 p.m.

"Organization." J. P. Luthringer, Peoria, Ill.

Symposium—"Method Used in Handling the Mid-winter Dental Clinic, Atlanta Dental Society." Thomas P. Hinman, Atlanta, Ga.; S. M. Cameron, Philadelphia, Pa.; Benjamin Sandy, Minneapolis, Minn.; Henry L. Whipple, Quincy, Ill.

R. OTTOLENGUI, *Publicity Committee.*

N. D. A. Committee on Transportation.

CONSULT the local ticket agent at your home town for complete information regarding fares, time limits, and stop-over privileges. There is on file in every ticket office the schedule which officially informs local agents of the rates from that point.

Do not leave the determination of the route until just before you are ready to start. Local ticket agents may have to obtain special tickets from their general offices, and must be notified in time so that the tickets will be available when you are ready to travel.

Central passenger association—Territory: Lower peninsula of the State of Michigan. All territory as far south as Ohio River, as far east as Buffalo and Pittsburgh, and as far west as a direct line drawn between St. Louis and Chicago. Two cents per mile in each direction. Signature form of tickets will be sold October 19th, 20th, and 21st, final return limit to reach the original starting-point not later than midnight, October 30th. A joint tariff authorizing fares for the annual session of the association from points in the Central passenger association territory has been compiled.

Round-trip rates authorized for our meeting from the principal points in the Central passenger association territory to New York and return are—

Battle Creek, Mich.	$29.25
Bay City, Mich.	28.00
Chicago, Ill.	36.30
Cincinnati, Ohio	30.10
Cleveland, Ohio	22.90
Columbus, Ohio	25.30
Dayton, Ohio	28.10
Detroit, Mich.	26.50
Grand Rapids, Mich.	30.55
Indianapolis, Ind.	32.50
Jackson, Mich.	27.45
Kalamazoo, Mich.	30.15
Saginaw, Mich.	27.50
South Bend, Ind.	32.10
Springfield, Ohio	27.10
St. Louis, Mo.	42.20
Terre Haute, Ind.	35.40
Toledo, Ohio	26.50

Trunk line association: This serves most of New York, Pennsylvania, New Jersey, Delaware, Maryland and West Virginia, also part of Virginia, and announces as available for those attending the coming session of the National Dental Association a railroad rate of two cents per mile in each direction with a minimum of $1.00 for the round trip on the certificate plan, going and returning via same route only. Going tickets in connection with certificates to be sold October 19th, 20th, and 21st at one-way fares applicable to New York City on the certificate plan. These certificates must be obtained from the ticket agent at the starting-point, and to be valid for the reduced rates returning must be indorsed by the secretary of the National Dental Association, indicating that the holder has been in attendance at the meeting and is entitled to the reduction; must also be validated by a special agent on either October 24th, 25th, or 26th. Return tickets will be sold on presentation of validated certificates October 24th–29th, at the difference between the fares paid on the going trip and the fares for the round trip; these latter tickets to be limited to continuous passage to destination, which must be reached in no case later than October 30th.

New England passenger association: Two cents per mile in each direction, short line mileage, going and returning via same route, and that one over which one-way tickets are regularly sold, and only from points where regular one-way fare to New York City is over $1.00. Tickets to be sold or certificates issued and good going October 19th, 20th, and 21st, and returning to reach original starting-point not later than midnight of October 30th.

Trans-continental passenger association: Summer-rate tickets from North Pacific Coast points may be purchased as late as September 29th, return limit October 31st.

Chicago and return	$80.00
St. Louis " "	77.50
New York " "	118.20

Regular nine-months excursion fares, approximating two cents per mile in each direction, are in effect daily from California and North Pacific Coast points.

From California to Chicago and return	$110.00
" " " St. Louis " "	103.00
" North Pacific points, Chicago and return	109.00
" North Pacific points, St. Louis and return	103.50

Western passenger association and Southwestern passenger association: To members located in this association, which comprises practically all the territory west, northwest and southwest of Chicago, it is advised that no special rates have been announced; you should therefore consult your local ticket agent regarding fares from your home city, and where possible arrange to purchase your tickets through, unless by purchasing tickets from your home town to St. Louis or Chicago you can then repurchase, taking advantage of the special rates from these points, as shown in the preceding paragraph, to New York City and return.

Special Train from Chicago.

For the accommodation of those going to the National Dental Association meeting in New York, October 22-26, 1917, arrangements have been made with the Michigan Central to operate the "National Dental Association special," leaving Chicago from the Michigan Central station, 12th st. and Michigan ave., at 5.40 P.M. Saturday, October 20th. This will be an all-Pullman train consisting of club car, compartment car, standard sleepers, observation car, and dining cars. The train will make intermediate stops on the Michigan Central at Kalamazoo, Mich., at 8.52 P.M., Battle Creek at 9.26 P.M., Jackson, Mich., at 10.24 P.M., Ann Arbor, Mich., at 11.14 P.M., and Detroit, Mich., at 12.01 midnight, and is scheduled to arrive in Niagara Falls at 7.25 A.M. Sunday, October 21st, where our train will be parked so that we may occupy our cars at any time during the day. The entire day may be spent visiting the various points of interest at Niagara Falls.

The Pullman fares from Chicago to New York including the occupancy of our cars if desired at Niagara Falls are $6.00 for lower berth, $4.80 for upper berth, $17.00 for compartment and $21.00 for drawing room.

Arrangements will be made with one of the principal hotels at Niagara Falls to serve breakfast. The special train will leave Niagara Falls at 7.20 P.M. Sunday, October 21st, and will arrive in New York, 7.50 A.M. Monday, October 22d, in ample time for the opening of our convention.

These special arrangements permit leaving Chicago at the close of the business day, Saturday, spending an entire day at Niagara Falls and still arriving in New York at a convenient hour on Monday morning. They give the opportunity of renewing old acquaintances and making new ones *en route*. Those desiring to use the "special" from Chicago going through to New York direct without stopping over at Niagara Falls can do so (arriving in New York at 5.30 P.M. Sunday, October 21st) by paying excess of $5.00 account fast time.

When purchasing your tickets, make sure that they read East of Chicago, via the Michigan Centr. to Buffalo, N. Y. Centr. to New York. Account fast time, an excess fare of $5.00 will be charged on all tickets reading from Chicago to New York on this train, but to those stopping over at Niagara Falls this excess will be refunded on presentation of tickets to the depot ticket agents at Niagara Falls.

For detailed information, consult any agent of the Michigan Central or write to Mr. Fred E. Deal, city passenger agent, Michigan Central, 228 S. Clark st., Chicago.

Let us get together this year and make this the best convention ever held by our Association, and also try as far as possible to travel on the special train as outlined above.

D. C. BACON, *Chairman.*

Rhode Island Board of Registration.

THE Rhode Island Board of Registration will hold a meeting on October 3, 4, and 5, 1917, for the purpose of examining candidates for the practice of dentistry. Information can be obtained from

ERNEST A. CHARBONNEL, *Sec'y,*
Providence, R. I.

Massachusetts Board of Examiners.

A MEETING of the Massachusetts Board of Dental Examiners for the examination of candidates will be held in Boston, Mass., October 2, 3, 4, and 5, 1917, inclusive. All applications must be filed with the secretary ten days before the examination.

GEORGE H. PAYNE, *Sec'y,*
29 Commonwealth ave., Boston, Mass.

Missouri Board of Examiners.

THE Missouri State Dental Board will hold the next examination October 8, 9, and 10, 1917, beginning Monday morning at 8 o'clock, Jefferson City, Mo.

Applications must be in the hands of the secretary at least ten days before the examination. For further information address

V. R. McCUE, *Sec'y,*
Cameron, Mo.

Arizona Board of Examiners.

THE next examination by the Board of Dental Examiners of Arizona for license to practice dentistry in that state will be held in Phœnix, beginning October 8, 1917, at 9 A.M. Examination fee, $25, and a sworn statement of candidate's qualifications on a blank furnished by the Secretary of State of Arizona should be in the hands of the Secretary of State at least twenty days before examination.

The secretary of the board will answer any letter of inquiry, but your application and fee should be sent to the Secretary of State.

EUGENE McGUIRE, *Sec'y,*
202-203 Noll Bldg., Phœnix, Ariz.

Maryland Board of Examiners.

The Maryland State Board of Dental Examiners will meet for examination of candidates for certificates on November 7 and 8, 1917, in Baltimore, at 9 A.M.

For application blanks and further information address
F. F. Drew, *Sec'y*,
701 N. Howard st., Baltimore, Md.

Nebraska Board of Examiners.

The Nebraska Board of Dental Examiners will hold a regular meeting in Omaha, November 6, 7, 8, and 9, 1917, at the Creighton Dental College. For information address
S. A. Allen, *Sec'y*,
Loup City, Nebr.

Michigan Board of Examiners.

The next session of the Michigan State Board of Dental Examiners for the examination of candidates wishing to practice dentistry in the State of Michigan will be held in the city of Ann Arbor (Dental College building) the week of November 5th to 10th inclusive. Applications should be made early, as all preliminaries must be complete and in the hands of the secretary not less than ten days prior to the examination. Photographs and itemized preliminary educational qualifications required of all candidates. For further information address
E. O. Gillespie, *Sec'y-treas.*,
Stephenson, Mich.

California Board of Examiners.

The next examination by the Board of Dental Examiners of California for a license to practice dentistry in that state will be held in San Francisco, beginning on the 7th day of December 1917, at 10 A.M.

All applications for examination must be filed with the board on December 7th. Each application must be accompanied by (1) the fee of $25; (2) necessary credentials (diploma and license from other states); (3) testimonials of good moral character, and (4) a recent unmounted photograph of the applicant.

By order of the Board of Dental Examiners of California.
C. A. Herrick, *Sec'y*,
133 Geary st., San Francisco, Cal.

Texas Board of Examiners.

The Texas State Board of Dental Examiners will hold its next examination in Dallas, beginning Monday December 17, 1917. No diplomas exchanged, no reciprocity. All applications, accompanied by the fee of $25, should be in the hands of the secretary not later than December 12th. For further particulars and application blanks address
Harrison B. Cave, *Sec'y*,
810-14 Wilson Bldg., Dallas, Texas.

Pennsylvania Board of Examiners.

The next examination of the Pennsylvania Board of Dental Examiners will be held in Musical Fund Hall, 808 Locust st., Philadelphia, and in the University of Pittsburgh, on Tuesday, Wednesday, Thursday, and Friday, December 4, 5, 6, and 7, 1917. The examination in operative dentistry will be held on Tuesday, December 4th, at 8.30 o'clock, in the Philadelphia Dental College, 18th and Buttonwood sts., Philadelphia, and the University of Pittsburgh; prosthetic dentistry on Tuesday, at 1.30. Application papers can be secured from the department of Public Instruction, Harrisburg. Address
Alexander H. Reynolds, *Sec'y*,
4630 Chester ave., Philadelphia, Pa.

Colorado Board of Examiners.

The Board of Dental Examiners of the State of Colorado will meet in Denver, Colo., Tuesday, December 4, 1917, at 8 A.M., for examination of applicants for license to practice dentistry in the State of Colorado.

In addition to the written examinations, applicants must supply their own patients, instruments, and materials, and come prepared to do practical work. Address
R. C. Quick, *Sec'y*,
310 Metropolitan Bldg., Denver, Colo.

South Dakota Board of Examiners.

The South Dakota State Board of Dental Examiners will hold its next examination at Sioux Falls, S. D., beginning January 7, 1918. All applications must be in the hands of the secretary by January 1st. Fee $25. Address
Robert Jasmann, *Sec'y*,
Scotland, S. D.

ARMY AND NAVY DENTAL NEWS.

American Red Cross Army Base Hospitals and Directors.

(July 1, 1917.)

No.	*Parent Institution.*	*Location.*	*Director.*
1.	Bellevue Hosp.,	New York City.	Dr. Edw. L. Keyes, 109 E. 34th st.
*2.	Presbyterian Hosp.,	New York City.	" Geo. E. Brewer, 16 E. 64th st.
3.	Mt. Sinai Hosp.,	New York City.	" N. E. Brill, Mt. Sinai Hosp.
*4.	Lakeside Hosp.,	Cleveland.	" Geo. W. Crile, 1021 Prospect st.
*5.	Harvard University,	Boston.	" Harvey Cushing, Peter Bent Brigham Hosp.
†6.	Mass. General Hosp.,	Boston.	" F. A. Washburn, Mass. Gen. Hosp.
7.	Boston City Hosp.,	Boston.	" J. J. Dowling, Boston City Hosp.
8.	N. Y. Postgraduate Hosp.,	New York City.	" Samuel Lloyd, 12 W. 50th st.
9.	New York Hosp.,	New York City.	" C. L. Gibson, 72 E. 54th st.
*10.	Pennsylvania Hosp.,	Philadelphia.	" R. H. Harte, 1503 Spruce st.
11.	St. Joseph and St. Mary Hosp.,	Chicago.	" A. J. Ochsner, 2106 Sedgwick st.
*12.	Northwestern Univ. Med. School,	Chicago.	" F. A. Besley, 104 S. Michigan ave.
13.	Presbyterian and County Hosp.,	Chicago.	" Dean D. Lewis, 122 S. Mich. ave.
14.	St. Luke-Michael Reese Hosp.,	Chicago.	" L. L. McArthur, 122 S. Mich. ave.
†15.	Roosevelt Hosp.,	New York City.	" Chas. H. Peck, 30 W. 50th st.
16.	German Hosp.,	New York City.	" Fred Kammerer, 51 E. 66th st.
†17.	Harper Hosp.,	Detroit.	" Angus McLean, David Whitney Bldg.
*18.	Johns Hopkins Hosp.,	Baltimore.	" John M. T. Finney, Johns Hopkins Hosp.
19.	Rochester General Hosp.,	Rochester.	" John M. Swan, 457 Park ave.
20.	Univ. of Pa. Hosp.,	Philadelphia.	" John B. Carnett, 123 S. 20th st.
*21.	Wash. Univ. Med. School,	St. Louis.	" Fred T. Murphy, 5738 Coates ave.
22.	Milwaukee County Hosp.,	Milwaukee.	" C. A. Evans, 809 Wells Bldg.
23.	Buffalo General Hosp.,	Buffalo.	" M. Clinton, 556 Franklin st.
24.	Tulane University,	New Orleans.	Maj. John B. Elliott, Maison Blanche Bldg.
25.	Cincinnati General Hosp.,	Cincinnati.	Dr. William Gillespie, 670 June st.
26.	State Univ. of Minnesota,	Minneapolis.	" Arth. A. Law, 420 Syndicate B'g.
27.	Univ. Pittsburgh Med. School,	Pittsburgh.	" R. T. Miller, Diamond Bank Bldg.
28.	Christian Church Hosp.,	Kansas City.	" J. F. Binnie, Rialto Bldg.
29.	Univ. of Colorado,	Denver.	
30.	Univ. of California,	San Francisco.	" E. S. Kilgore, 1431 Willard st.
31.	Youngstown Hosp.,	Youngstown.	" Colin R. Clark, 415 Bryson st.
32.	City Hosp.,	Indianapolis.	" Edm. D. Clark, 1236 N. N. J. st.
33.	Albany Hosp. and Med. Coll.,	Albany.	" W. A. Elting, 119 Washington st.
34.	Episcopal Hosp.,	Philadelphia.	" A. P. C. Ashhurst, 811 Spruce st.
35.	Good Samaritan Hosp.,	Los Angeles.	" J. J. A. Van Kaathoven, Grand ave. & 7th.
36.	College of Medicine,	Detroit.	" Burt R. Shurly, 32 W. Adams st.
37.	King's County Hosp.,	Brooklyn.	" E. H. Fiske, 132 LaFayette st.
38.	Jefferson Med. Coll.,	Philadelphia.	" W. M. L. Coplin, Jefferson Hosp.
39.	Mass. Homeopathic Hosp.,	Boston.	" W. F. Wesselhoeft, 398 Marlb. st.
40.	Good Samaritan Hosp.,	Lexington, Ky.	" David Barrow, 190 N. Upper st.
41.	Univ. of Virginia,	University, Va.	" Wm. H. Goodwin, Box 453.
42.	Univ. of Md. Med. School,	Baltimore, Md.	" A. C. Harrison, 31 E. North ave.
43.	Emory University,	Atlanta, Ga.	" E. C. Davis, Emory University.

* Have sailed. † Under orders to sail.

Dentists and the Military Service Act.

(Great Britain.)

On a previous occasion we drew attention to the position of registered dentists under the Military Service Act, and in the course of our remarks we pointed out how comparatively small was the number of registered dentists available for the civilian population, supporting the view that the further withdrawal of dental surgeons would be detrimental to the public well-being. Still further, we suggested that if qualified dentists were to be brought under the working of the act they should be employed in their professional capacity rather than as combatants. This view that there is a danger in reducing the number of registered dentists would seem to be held by the Central Tribunal, for a decision recently made contained these words:

"The Central Tribunal, from evidence submitted to them, are impressed with the danger of further reducing the number of registered dentists now in this country. Whether any particular dentist should be granted exemption must obviously depend to some extent upon the requirements of the place in which he practices, but they are inclined to think that unless it be shown that his services are not required he should be granted exemption."

A memorandum has now been issued by the Army Council which goes some way to regularize the position of registered dentists. Briefly, all applications for exemption are to be dealt with by local tribunals. Should the tribunal decide that the claim for exemption is not substantiated, then, in the case of a man who was under thirty-five years of age on January 1, 1917, and who remained in category A, he should be available for military service; on the other hand, all those under thirty-five years of age, not fit for general service—that is to say, in categories lower than A—and all men of thirty-five and over, will be exempted from military service provided that they place themselves at the disposal of a Dental Service Committee. This committee is to contain representatives of the British Dental Association, medical representatives, and representatives of government departments, and we believe it is also to include a representative from the Central Medical War Committee. The duty of this committee will be to ascertain in what districts there is an urgent need for dentists under existing conditions, and to supply the needs of these districts with the help of those men who place themselves at the disposal of the committee.

There is no question that the present arrangements, as detailed in the memorandum, are a distinct step in advance. Considering the scarcity of qualified dentists, we are still of the opinion that every qualified dentist should continue to be employed in his professional capacity, if not among the civilian population, then in the army. If, however, the army considers that there is an excess of dentists for the population, and that no more dental surgeons are required for the army, then it would seem desirable that the class which, under the present memorandum, are to be passed for service should be used in the R. A. M. C. It should be remembered that all these men hold a dental qualification, and that infers that they have gone through a certain amount of medical training. We therefore think that they would be more useful in some medical capacity than as combatants.—*Lancet.*

A Hospital for Facial and Jaw Injuries.

As the war has gone on, the need for special hospitals has become more and more recognized, with a view to an economy of effort. Plastic surgery, which has been extensively carried out in various places, is now to be dealt with in certain centers where concentration of material and operators will tend to give the best results. Fractured jaws have been found to entail much surgical and dental treatment before they are ready for plastic work, and such preparation forms a large part of the hospital work required in such cases. The Queen's Hospital at Frognal, Sidcup (Kent), an appeal for which appears in our correspondence columns, owes its inception to Mr. C. H. Kenderdine, one of the originators of Queen Mary's Hospital at Roehampton. It has been established to deal with facial jaw injuries, and aims at restoration by means of surgical procedure, with a resort to the use of artificial features only in extreme cases.

Facial plastic surgery implies the building up of the features and restoration of contour from the patient's own tissues, with the transferrence for this purpose of portions of skin, bone, or cartilage. A museum has recently been started at the hospital containing pastel drawings of the condition of wounds before and after treatment by Professor Henry Tonks, F.R.C.S.Eng., whose help and that of the sculptor, Mr. J. W. Edwards, have contributed much to the work of the surgeons.

The chief consulting surgeon to the Queen's Hospital is Sir Arbuthnot Lane, Bart., who is assisted in the special plastic work by Captain H. D. Gillies, R.A.M.C., Captain J. L. Aymard, R.A.M.C., and a staff of dental surgeons and skilled mechanics. It is hoped that recovery will be greatly accelerated by the situation of the hospital in country air. A home farm and poultry farm form a part of the scheme, occupation being found for the men approaching convalescence, with a view of saving them from the mental depression by which many are beset. Workshops also are being established where practical instruction will be given in estate carpentry and other handicrafts.—*Lancet.*

Eleven Thousand Commissions Offered; Five Thousand Accepted.

According to the Council of National Defense, approximately eleven thousand commissions have been offered in the Medical Reserve Corps, of which only about five thousand have been accepted. The medical section of the Council is undertaking an investigation of the cause of this condition of affairs.

Dentistry in the New Zealand Forces.

TRENTHAM MILITARY CAMP, N. Z.,
July 13, 1917.

PROF. E. C. KIRK, Philadelphia, Pa.:

Dear Doctor,—Under separate cover I am forwarding you a copy of the *New Zealand Dental Journal*, as I thought it would be of interest to you. You will notice in its pages that New Zealand is considering the adoption of state dentistry for school children. After the war, I think it will be introduced in some form; but it is a big thing, and will want careful organization.

The D.D.S. graduates of Pennsylvania are mostly doing very well, and are among the leading dentists in New Zealand. They have responded to the Empire's call, and the following are in the New Zealand Corps:

	U. of P. Class
Major E. C. Winstone	1910
Capt. R. I. Sutton	1910
“ M. K. Litchfield	1910
“ L. P. Haywood	1910
“ H. K. Allison	1909
“ F. C. Tibbs	1909
“ Jas. Glendining ..*sp'l*	1903
Lieut. A. B. Jones	1911
“ M. P. Astley	1910
“ E. L. Renton	1908
“ H. F. Swinburn	Postgraduate
“ H. C. Edwards	“

The New Zealand Dental Corps is a big unit, having in all seventy-two dentists ranking as officers, from lieutenant up to lieut.-colonel, and stationed at the front, base camps in England, on transports, and in the training camps in New Zealand.

I wish now to describe to you the

Dental Hospital at Trentham Military Camp.

The hospital has a long clinic room with eighteen chairs running along two wings, and has a separate extracting-room and laboratory.

Except for a small proportion of silicate cement fillings, the fillings are all amalgam, and in many cases large restorations are built up and anchored by posts in the roots, this being done in order to avoid dentures as far as possible. Unfortunately, however, many cases are so bad that we have no alternative but to extract and insert dentures.

The dentures are made of vulcanite, mostly of red with a very small veneer of pink, heavier than usual, and as far as possible with an edge-to-edge bite, the vulcanite being brought well up the backs of the teeth to give additional strength.

The teeth of the New Zealanders are in a shocking condition, and out of 40,000 men examined, only 39 had a complete set of teeth free from caries. From these facts you will realize that our work is a never-ending problem, for each draft brings with it its fresh work.

Of course the work is divided according to its various branches—that is, special officers are doing fillings, extractions, and dentures respectively; but the following daily average at Trentham for the year 1916 may be of interest to you, showing as it does the average amount of work done per officer per day during the year: Fillings, 12.3. Root-fillings, 0.6. Root-dressings, 0.57. Extractions, 6.65. Scalings, 0.75. Sundries, 1.19. Dentures attendances, 4.29. Total attendances, 13.37. The average number of dentures made per mechanic per day is 1.86, and repaired, 0.48.

The fillings, root-fillings, and dentures run into thousands a year. Not having the figures for the other camps I cannot give them, but the above averages will give you some idea of the amount of work being done. Over 30 per cent. of the New Zealand reinforcements could never go to the front were it not for dentures, and in addition the majority of the remainder need a great number of fillings and extractions in order to render them fit and eliminate as far as possible all risk of pain and trouble of dental origin in the trenches.

After the war, and all being well, I am looking forward to another visit to Pennsylvania, when I hope to be able to take a post-graduate course.

Yours sincerely,
ERNEST C. WINSTONE.

Report of the Military Committee of the Rhode Island Dental Society.

August 30, 1917.

To the officers and members of the Rhode Island Dental Society:

At the time of the mobilization of the several state military organizations as ordered by President Wilson in June 1916, the officers of the Rhode Island Dental Society felt that something of a material benefit could be done for the recruits if the members of the dental profession of the state were allowed to visit Camp Beekman at Quonset Point, R. I., where a battery of field artillery, cavalry troops, and the ambulance corps of the Rhode Island National Guard were to be stationed.

A committee was appointed by the president of this society to confer with the commanding officer, Capt. T. A. Roberts, U. S. Cavalry, as to the best methods to be pursued. Captain Roberts was very enthusiastic concerning the project, and many times displayed his enthusiasm by his suggestions to the committee and orders to the officers of the several military organizations.

Our effort at that time, we feel, was amply repaid, as splendid results were obtained in the very few days the men were in the home camp, namely:

328 Fillings,
103 Extractions,
87 Cleanings,
43 Treatments,
1 Gold filling,
13 Synthetic fillings,
3 Crowns re-cemented,
23 R. C. fillings,
22 G. P. fillings.

A letter from the Adjutant-general at Washington to the chairman of the committee, dated July 27, 1916, stated that the Secretary of War directed him to express his appreciation of the spirit and work of the society.

At the regular quarterly meeting of the society, held March 30, 1917, the following resolution was introduced and unanimously adopted:

> *Whereas*, the dental work performed by members of the Rhode Island Dental Society upon the state troops at Camp Beekman last July showed that the mouths of the enlisted men were greatly in need of dental attention; and
>
> *Whereas*, the members of the Rhode Island Dental Society realize the grave situation in which the country is placed; therefore be it
>
> Resolved, That the Rhode Island Dental Society offers to the State of Rhode Island the services of its members for the purpose of attending to the immediate and necessary dental needs of the Rhode Island troops as soon as they are mobilized.
>
> That a committee be appointed by the president of the Rhode Island Dental Society to facilitate the working out of the plan, with the power to carry on the work as seems best to the committee.
>
> That a copy of these resolutions be forwarded to his Excellency R. Livingston Beekman, Governor of Rhode Island.
>
> That the said committee confer with the Governor and other state officers as to the best means of carrying on the work.

The president appointed the committee as undersigned.

Within a few days after the appointment of the committee a battalion of coast artillery consisting of four companies was ordered on duty under command of Major Johnson. Detachments were stationed at many points throughout the state, at the several railroad bridges, reservoirs, pumping stations, etc.

Following a conference with Major, now Lt.-Col. Johnson—who seemed anxious that his battalion be put in good condition as far as their teeth were concerned, and assisted the committee in every way he could—examination charts and blanks were purchased by this committee, and on Sunday, April 22d, every man in the entire battalion was examined and a careful record made of the conditions found, with the following results:

Number of men examined,	407
Teeth needing immediate attention,	2687
Teeth or roots to be extracted,	407
Number of mouths in good condition,	16

This examination proved to your committee the deplorable condition of the mouths of the men, and they considered it would compare favorably with the conditions existing throughout the entire United States. If such were the case, it would be a physical impossibility to correct this misfortune even if every dentist of the country were employed, as Congress had already authorized the raising of an army of approximately 2,000,000 men, this army to be increased from time to time.

By an act of Congress in 1911 the several states were authorized to commission dental surgeons in their National Guards, but Rhode Island had neglected to do so.

It is a pleasure therefore for us to report that, as the result of a conference with the Governor, three of our local dentists were commissioned and have been mustered into the regular army as 1st Lieuts. D. C.—namely, Drs. Wm. Clegg, Raymond L. Webster, and Ralph H. Hankins.

On July 25th the twenty companies of our coast artillery were mobilized at the several fortifications in Narragansett Bay, at Boston, and at New Bedford. The three battalions of field artillery, four troops of cavalry, and ambulance corps mobilized at Camp Beekman.

These troops, however, were ordered to move on August 17th, and the members of this society had very few days in which to demonstrate their willingness to do their "bit" from a professional standpoint, but what little was accomplished greatly aided the men individually and the army as an organization.

Lieut. Clegg, whose orderly kept a record of work done, reports the following: The teeth of 68 men were put in good condition; 31 partially so. There were 124 fillings inserted, 19 treatments, 28 cleanings, 41 extractions, several crowns re-cemented, and many aches temporarily relieved.

While the work of this committee as instructed by the resolution which created it is completed, yet we feel that more work could and should be done, as many of our citizens will later on be drafted into the service of our country. We would recommend that the Executive Council take this matter under advisement.

WALTER R. MCINTIRE, *Chairman,*
JAMES E. HEAP,
WM. B. ROGERS,
HARRY L. GRANT,
FRANK P. DUFFY,
Committee.

Necessary Field Equipment for Dental Reserve Corps Officers.

(1) UPON receiving your commission as first lieutenants in the Dental Reserve Corps, you should at once provide yourself at your own expense with the following articles, so as to be in readiness to obey orders, as it is contemplated that you will shortly be ordered to active military duty. The following is the minimum you should have at once. They can be purchased from the quartermaster's department at the nearest post, or you can get them from a military equipment house:

1 hat, service.
2 breeches, service (olive drab).
1 coat, service (olive drab).
2 shirts, woolen (olive drab).
2 pairs shoes, russet (Army type, broad toes).
1 slicker, saddle (to be used as a raincoat).
2 blankets, army.
1 mosquito bar.
1 cot (army).
1 bedding roll.
1 waist belt.
1 tag, identification.
5 pair shoe laces, extra.
1 sleeping pad (or 2 comforters, light).
1 or 2 standard quartermaster trunk lockers.

If winter, one overcoat purchased, buttons changed and insignia of rank placed on sleeve.

You may use your own underclothing, socks, handkerchiefs, and toilet articles.

Additional articles to the above list can be purchased later.

(2) The following must be purchased from private dealers in military uniforms and equipment:

1 hat cord, officer.
Collar insignia and insignia of rank (4 letters "U.S.R." bronze, for coat. 4 caduceus with "D.C." superimposed on the caduceus. 4 first lieutenant bars).
1 canvas basin.
1 canvas bucket.
1 collapsible candle lantern.
1 folding camp chair.

(3) The following mess equipment must be secured from the ordnance officer at the nearest military post, or by sending a certified check, after ascertaining the cost, to the Commanding Officer, Rock Island Arsenal, Rock Island, Illinois. (Private dealers also sell them.)

1 canteen and canteen cover, mounted.
1 cup, 1 knife, 1 fork, 1 spoon.
1 can, bacon; 1 can, condiment; 1 can, meat.
1 pouch with first aid package, with cover.

(4) If you wear eye-glasses take along an extra pair or two. Have at least one of them spectacles with strong frames.

(5) The tentage and its accessories you will need can be drawn from the quartermaster's department on memorandum receipt, at your first station.

(6) When the Government calls you out, it needs your services at once. Promptly obey your order to report for duty on its receipt. Only the War Department can authorize delay.

Upon receipt of orders placing you on active duty, until such time as you may be relieved from same, you will wear the uniform on all occasions. Take no civilian clothes with you, as you will not be allowed to wear them.

(7) Buy your own ticket from your home to your station. You will later be reimbursed at the rate of 7 cents per mile if traveling without troops.

(8) *Ship your bedding roll with your baggage on your ticket, as it will be impossible to provide you with bedding when you report for duty at a post.*

(9) If going with expeditionary forces to Europe, each first lieutenant can take 350 lbs. baggage at Government expense. This allowance shall include equipment C (as noted above), professional books, and all necessary clothing and bedding for extended field service. These must be packed in the standard quartermaster trunk lockers, and bedding rolls or their equipment in similar containers.

(10) On arrival at your station, report yourself in uniform to the commanding officer for duty, and as soon thereafter as possible report to the surgeon, who is your immediate commanding officer. The commanding officer or his assistant will see that you are provided with quarters and inform you how to arrange for mess facilities.

(11) The Government provides you with fuel and light, gratis.

(12) After you arrive at your post, start systematically at once to familiarize yourself with contents of "Army Regulations," "Manual of the Medical Department," as pertains to you, as an officer of the Dental Corps, and with the necessary paper work and reports. The only way to learn army paper work is to do it, thus acquiring a practical working-knowledge of the subject. For further information secure the advice of any medical or dental officer of the army in your vicinity.

(13) If ordered to accompany expeditionary forces to Europe, you must not divulge either orally, by letter, or telegram, to anyone the time or place of embarkation.

Army Medical Reserve Corps.

COMMISSIONS in the reserve branches of the army medical department have been recommended and acceptances made as follows up to August 25th:

Medical Reserve Corps. Recommended to Adjutant-general's office to date, 14,451; acceptances recorded—Majors, 338; captains, 1470; lieutenants, 7336. Total, 9144.

Dental Reserve Corps. Acceptances recorded, 892.

Veterinary Reserve Corps. Acceptances recorded, 615.

Sanitary Corps. Acceptances recorded, 48.

FOLLOWING is a memorandum approved by the Secretary of War. Many reserve officers are now physically examined for commission and ordered to active service a few days later. The existing provision, that a reserve officer must be re-examined physically when ordered to active service, compels unnecessary physical examinations in such cases.

Memorandum.

"Members of the officers reserve corps who have had a complete and satisfactory physical examination by a medical officer not more than three months prior to being called into active service, the examination being properly recorded in the War department, may, in the discretion of their commanding officers, be regarded as physically qualified for active service on presentation of their own signed certificate that their physical condition has not changed since the last physical examination."

The above-quoted memorandum modifies the provisions of para. 10, special regulations No. 43, Officers Reserve Corps, published in Bull. No. 64, current series.

MEMBERS of officers reserve corps may purchase from the quartermaster corps such articles of uniform clothing, clothing materials, and equipage as they need, provided the property is available. They will certify that the articles are for their personal use. This is a new army regulation (para. 1174).
—*Army and Navy Register.*

Dental Officers Reserve Corps.

Ackerman, Bernard A., Loogootee, Ind.
Arbuckle, James H., Columbus, O.
Baker, Edwin C., Roslindale, Mass.
Bean, Lonzo G., Athens, O.
Benham, Raleigh F., Indianapolis, Ind.
Blaney, Alva N., St. Louis, Mo.
Bodine, Roy L., Indianapolis, Ind.
Brown, Carver Rollins, El Paso, Tex.
Burris, Harrison Lee, Indianapolis, Ind.
Case, Maurice A., Denver, Colo.
Charron, Wilbur A., Ware, Mass.
Cheney, Joseph E., Fitchburg, Mass.
Chestnutt, O. L., Macon, Ga.
Christman, George, Cambridge, Mass.
Coffman, Troy, Harrison, Ark.
Colwell, Hazin Loyd, Indianapolis, Ind.

Cook, Herman W., Atlanta, Ga.
Conlon, Hugh D., Niles, O.
Cox, James E., Charlestown, Mass.
Day, Frederick W., Gardiner, Me.
Delbridge, William H., Greeley, Colo.
De Wolf, Charles A., Kansas City, Mo.
Donaldson, Robert L., Detroit, Mich.
Donovan, Edward J., Wakefield, Mass.
Dunn, Howard, Oakland, Cal.
Epling, William Clyde, Princeton, W. Va.
Ferguson, James W., Marion, Ill.
Gephardt, Ralph A., Anderson, Ind.
Goddard, Malcolm, San Francisco, Cal.
Goering, Ernest Henry, Duluth, Minn.
Gonder, Frank C., Lorain, O.
Grannick, Theodore D., Denver, Colo.
Gray, Charles John, Petoskey, Mich.
Green, Walter H., Akron, O.
Gunter, Newton C., Pueblo, Colo.
Holmes, Frank A., Indianapolis, Ind.
Izlar, Marion C., Ocala, Fla.
Jones, Harry Gresham, Francisville, Ind.
Lafayette, T. E., Jr., Watertown, Mass.
Latta, Robert E., Hamlet, N. C.
Lynch, Wm. F., Somerset, Mass.
Keene, Stanley C., Roslindale, Mass.
Keffer, Clarence C., Union City, Ind.
Kelly, Edmund John, El Paso, Tex.
Kemper, Homer T., St. Louis, Mo.
Kerr, Ralph Moore, Sidney, O.
McAboy, Ernest T., Huntington, W. Va.
McKay, Otho Lorenzo, Windfall, Ind.
McGibbon, E. E., Minneapolis, Minn.
Muedeking, ——, Minneapolis, Minn.
Mulligan, Charles E., Coshocton, O.
Musgrave, Arthur C., Ohio City, O.
Niswonger, Milo Eugene, Dayton, O.
O'Keefe, Clarence S., Taunton, Mass.
Park, William E., Akron, O.
Payne, Hope H., Pelham, Ga.
Peacock, Harold L., Boston, Mass.
Putnam, Ralph B., Portland, Me.
Redhead, Will L., Cleveland, O.
Robbins, Earle, Dugger, Ind.
Roselle, Mark James, Anderson, Ind.
Ross, William E., Oakland, Cal.
Ruggles, Stewart D., Portsmouth, O.
Schoppe, Vincent F., St. Louis, Mo.
Sizelan, Fred Cameron, Brownsville, Tex.
Steiner, Elmer, Columbus, O.
Stewart, Frank A., Girard, Ill.
Stout, Roy Albert, Cincinnati, O.
Taylor, George Pike, Reynoldsburg, O.
Thompson, Edward L., Breckinridge, Mo.
Tudury, Ralph B., New Orleans, La.
Tye, Thomas H., Cameron, Mo.
Van Wyck, Crittenden, San Francisco, Cal.
Webb, Edmund M., Attleboro, Mass.
White, Roy, Gretna, La.
Willis, Frank A., Manchester, Mass.
Wilson, Harry W., Denver, Colo.
Winship, F. H., Jr., New Bedford, Mass.
Wisecup, Clarence E., St. Louis, Mo.
Withrow, George A., Milan, Ind.

[This is as complete a list as we can give of those who have been commissioned in the Dental Officers Reserve Corps since the publication of the list in our September issue.—Ed.]

Army Dental Corps.

As a result of recent examinations, 34 candidates have been found qualified for commissions in the Army Dental Corps. Some 90 additional candidates will probably be appointed, their papers now being in process of marking at West Point. Those who have qualified to date are as follows:

Akeroyd, James E., Dresden, O.
Andrews, Chas. L., Frankfort, Tenn.
Anthony, Alvin E., Cumberland, Md.
Barchill, Arthur T., Dunmore, Pa.
Bischof, Julius L., Belleville, Ill.
Boyd, Jos. L., Shreveport, La.
Bramwell, Chas. H., Kansas City, Mo.
Caldwell, Wm. B., Columbus, O.
Campbell, John C., Eugene, Ore.
Collins, Henry H., Denver, Colo.
Conner, James R., Los Angeles, Cal.
Dannheisser, Alvin D., Montgomery, Ala.
Dean, Benj. H., Louisville, Ky.
Dean, James E., Oklahoma City, Okla.
Eiche, Melvin R., Marshfield, Wis.
Embree, Harold S., Fresno, Cal.
Finley, Horace R., Los Angeles, Cal.
Fisher, Raymond H., Atlanta, Ga.
Fritsche, Jerome L., Minneapolis, Minn.
Gaynor, Clement J., St. Louis, Mo.
Gray, Dell S., Hale, Mo.
Harlan, Leslie S., Jamestown, Ind.
Hays, Cecil R., Toledo, O.
Herms, Frederick W., Patton, Cal.
Hoblitzell, Wm. H., Cincinnati, O.
Hogan, Henry L., Covington, Ky.
Hollam, Curtis W., Washington, D. C.
Holmes, Avery G., Southport, N. C.
Jacobson, Clarence R., Tracy, Minn.
Johns, Glover, San Antonio, Tex.
Kennebeck, George R., Wall Lake, Ia.
Krakow, George, Lagrange, Ill.
Lindsey, Hooker O., Shreveport, La.
McCollum, Neil J., West Frankfort, Ill.
MacKenzie, Norman M., Redwood, Cal.
Moore, Wm. A., Lawrence, Kan.
Newman, Roy R., Baltimore, Md.
Parker, Harold J., New York City.
Price, Milton A., Princeton, Minn.
Purviance, Bryan S., Los Angeles, Cal.
Ragan, Adrian C., Hannibal, Mo.
Rahm, Joseph L., Vine Grove, Ky.
Rhodes, Fletcher D., Cape Girardeau, Mo.
Rose, Walter A., Columbus, O.

Rowe, John A., Winnemucca, Nev.
Smith, Alexander M., Jr., Nashville, Tenn.
Smith, Boyd L., Albany, Mo.
Smith, Eugene A., Frostburg, Md.
Starr, Roy E., Philadelphia, Pa.
Stewart, Wm. B., Kansas City, Mo.
Strickland, Robert L., New Haven, Conn.
Tench, Francis M., Buffalo, N. Y.
Thompson, Richard F., St. Joseph, Mo.
Thompson, Richard K., Washington Barracks, D. C.
Vail, Walter D., St. Louis, Mo.
Waly, L. W., Bingham Canyon, Wash.
Williams, William T., Tompkinsville, Ky.
Wilson, Leland S., Tacoma, Wash.
Wright, Clarence J., Lansing, Mich.

The papers of a few of those candidates not on this list are being reconsidered, and they may be announced as qualifying later. The earlier list of those who qualified, 35 in number, was printed in the DENTAL COSMOS for September.

Coming Examinations for the Army Dental Corps.

ONE HUNDRED VACANCIES.

1. The Surgeon-general of the Army announces that there are, at the present time, approximately 100 vacancies in the Dental Corps, and that examinations for the appointment of dental surgeons will be held at—Fort Slocum, New York; Columbus Barracks, Ohio; Jefferson Barracks, Missouri; Fort Logan, Colorado; Fort McDowell, California, and Fort Sam Houston, Texas, on Monday, November 12, 1917.

2. Application blanks and full information concerning these examinations can be procured by addressing "Surgeon-general U. S. Army, Washington, D. C."

3. The Dental Corps is one of the constituent members of the Medical Department of the Army. It consists entirely of officers, who are commissioned as dental surgeons. Appointments therein are authorized at the rate of 1 for each 1000 enlisted men of the line of the army. During the first eight years of their service dental surgeons have the rank, pay, and allowances of first lieutenants. After eight years they have the rank, pay, and allowances of captains, and after twenty-four years, the rank, pay, and allowances of majors; subject, however, to such examination prior to advancement as the President may prescribe, and to the proviso that the number of dental surgeons with the rank of major shall not at any time exceed fifteen.

4. No applicant may under existing law be commissioned in the Dental Corps unless he is between twenty-one and thirty-two years of age, a citizen of the United States, a graduate of a standard dental college, and of good moral character, nor unless he shall pass the usual physical examination required for appointment in the Medical Corps, and a professional examination which shall include tests of skill in practical dentistry and of proficiency in the usual subjects of a standard dental college course. Whether or not the applicant is married has no effect upon his eligibility for the Dental Corps.

5. Application for appointment must be made in writing to the Surgeon-general of the Army upon the prescribed blank form. All the interrogatories on the blank must be fully answered. In compliance with the instructions thereon the application must be accompanied by testimonials, based upon personal acquaintance, from at least two reputable persons, as to the applicant's citizenship, character, and habits. The selection of the candidates is made by the Surgeon-general from the applications submitted, and formal invitation to report for examination to the most convenient examining board in each case will be issued by him.

6. The examinations are conducted under instructions from the Surgeon-general, and usually last six days. No allowances can be made for the expenses of applicants undergoing examination, whether incurred in travel to and from or during their stay at the place of examination, as no public funds are available for the payment of such expense. Each applicant, upon presenting himself to the board, will, prior to his physical examination, be required to submit his diploma as a graduate of a standard dental college. Should he fail to do so the examination will not proceed.

7. To each commissioned rank in the army is attached a fixed annual salary, which is received in monthly payments, and this is increased by 10 per cent. for each period of five years' service until a maximum of 40 per cent. is reached. A dental surgeon with the rank of first lieutenant receives $2000 per annum, or $166.66 monthly, during his first five years' service. At the end of five years his annual pay is increased to $2200 or $183.33 a month. At the end of eight years he is advanced to captain and receives $2400 a year, plus 10 per cent. for his first five years' service, making $2640,

or $220 a month; and thereafter his annual pay is, at the end of ten years, $2880, or $240 a month; at the end of fifteen years, $3120, or $260 a month; at the end of twenty years, $3360, or $280 a month. At the end of twenty-four years he is advanced to major and receives $4000 a year, that being the pay of his grade, $3000 plus increase for prior service of twenty years up to $4000, which is the maximum allowed by law to a major. In addition to their pay proper, they are furnished with a liberal allowance of quarters, according to rank, either in kind or where no suitable Government building is available, by commutation. Fuel and light therefor are also provided. When traveling on duty an officer receives mileage for the distance traveled. On change of station he is entitled to transportation of professional books and papers and a reasonable amount of baggage at Government expense. Groceries and other articles for their own use may be purchased from the quartermaster at about wholesale cost prices. Dental surgeons are entitled to medical attendance and hospital treatment without charge other than for subsistence.

8. Officers of the Dental Corps are entitled to the privilege of retirement after forty years' service, or at any time for disability incurred in the line of duty. On attaining the age of sixty-four they are placed on the retired list by operation of law. Retired officers receive three-fourths of the pay of their rank (salary and increase) at the time of retirement.

9. In order to perfect all necessary arrangements for the examination, applications must be in the possession of the Surgeon-general at least two weeks before the date of examination. Early attention is therefore enjoined upon the intending applicants.

Assignments.

Army Dental Reserve Corps.

Week ending August 18th.

1st Lieut. Sturges B. Shields is assigned active duty at West Point, N. Y.

1st Lieut. John A. Younglove is assigned active duty at Camp Robinson, Wis.

1st Lieut. Guy W. Angelo is assigned active duty at Fort Oglethorpe.

1st Lieut. Chas. J. Denholm is assigned active duty at Fort Oglethorpe.

1st Lieut. Orville A. Grove is assigned active duty, Southern Department.

The following, now at Fort Adams, are assigned to provisional coast artillery brigade at that post: 1st Lieuts. Cranston F. Godfrey, Joseph M. McGrath, Gerald B. O'Neil, and J. Henry Summerfield.

The following are assigned active duty: 1st Lieuts. J. D. Albin, E. E. Boyd, E. C. Braninger, C. T. Brann, D. M. Buckley, J. C. Campbell, W. E. Henshaw, and G. L. Ross.

1st Lieut. E. J. Kelly is assigned active duty, Southern Department.

1st Lieut. C. P. Shewey is assigned active duty at Fort Benjamin Harrison.

Week ending September 1st.

1st Lieut. Robert E. F. Millington, to Wrightstown, N. J., Camp Dix, for duty.

1st Lieut. Harold S. Flanagan, to Gettysburg, Pa., for duty.

1st Lieut. Fred C. Sizelan, to Waco, Tex., Camp McArthur, for duty.

1st Lieut. A. F. Wilbur, to New York with 8th reserve Engineers.

1st Lieut. Edward R. Danforth, to Fort Benjamin Harrison for duty.

1st Lieut. Henry T. Dean, to Fort Riley for duty.

Week ending September 8th.

1st Lieuts. Gordon W. Hannah and Edwin H. Smith, to Camp Dix, Wrightstown, N. J., for duty.

1st Lieut. Nelson T. Shields, Jr., to Fort Jay for duty.

1st Lieut. Walter T. Clark, to Fort Benjamin Harrison for duty.

1st Lieut. Henley E. Miller, to Letterman General Hospital for duty.

Week ending September 15th.

The following to Fort Des Moines, Iowa, for duty: 1st Lieuts. F. C. Carter, J. L. Crawford, and E. J. Cobb.

The following to camp indicated for duty: 1st Lieuts. W. J. Scruton, Camp Meade, Annapolis Junction, Md.; J. F. Woodbury, Camp Dix, Wrightstown, N. J.; C. R. Wagner, Camp Shelby, Hattiesburg, Miss.

1st Lieut. A. L. Bruener, to Fort Snelling for duty.

1st Lieut. F. P. K. Barker, to Fort Slocum for duty.

1st Lieut. C. T. Messner, to Fort Benjamin Harrison for duty.

The following to Garden City, Long Island, 42d division, for duty: 1st Lieuts. C. F. Stekl, Trevor Wright, J. T. Cornwall, R. I. Wood, G. E. Kirschner, L. C. Whitlock, C. O. Fay, A. V. Seifert, V. B. Souby, W. A. Calvert, and R. F. Darwin.

1st Lieut. Campbell G. Tipton, to Fort Riley, Camp Funston, for duty.

1st Lieut. John J. Small, to Wrightstown, N. J., Camp Dix, for duty.

1st Lieut. Fred L. McAninch, to Fort Benjamin Harrison for duty.

1st Lieut. Cecil D. Washburn, to Rockford, Ill., Camp Grant, for duty.

Army Dental Corps.

Week ending August 18th.

THE following are assigned active duty at posts specified: 1st Lieuts. L. K. Anderson, Fort Sheridan; C. R. Hollister, Fort Snelling; S. J. Rohde, Fort Riley.

1st Lieut. J. L. Brause is assigned active duty at Gettysburg, Pa.

The following are assigned active duty, Central Department: 1st Lieuts. R. M. Kisner, Camp Sherman, and E. A. Thorne, Camp Taylor.

Week ending August 25th.

1st Lieut. N. A. Harper is assigned to Panama Canal Department.

1st Lieut. Fred Tiesse, Jr., ordered duty at Fort Riley.

1st Lieut. Ozias Paquin is assigned active duty at Fort Riley.

Week ending September 1st.

1st Lieuts. Albert S. Cumming and Harry E. Smalley, to Syracuse (N. Y.) reorganization camp.

1st Lieut. Hugh M. Tarpley, to Fort Monroe for duty.

1st Lieut. Harold E. Albaugh, to Chillicothe, Ohio, Camp Sherman, for duty.

Week ending September 15th.

The following first lieutenants are assigned to place specified for duty: F. C. Daniels, Camp Devens, Ayer, Mass.; T. F. Leary, Camp Devens, Ayer, Mass.; E. J. McClung, Camp Lewis, American Lake, Wash.; L. H. Tingay, Camp Custer, Battle Creek, Mich.; C. R. Boone, Fort McPherson, Ga.; H. A. Donahue, Fort Ethan Allen, Vt.; D. L. Edwards, Fort McDowell, Cal.; Timothy Harden, Fort Screven, Ga.; L. P. Hartley, Columbus Barracks, Ohio; E. L. Hering, Fort Sam Houston, Tex.; J. B. Manning, Fort Sam Houston, Tex.; N. C. Pickles, Camp Kelly, San Antonio, Tex.; Wm. C. Webb, Jr., Jefferson Barracks, Mo.; M. H. Welch, base hospital No. 4, Eagle Pass, Tex.; Wm. D. White, Camp Stewart, El Paso, Tex.; O. J. Christiansen, Letterman General Hospital.

1st Lieut. Arthur J. Hart, from Army Medical School to Fort Logan for duty.

Capt. Alden Carpenter, in addition to his other duties, will report at Camp Travis, Fort Sam Houston, for duty in charge of dentists and dental property.

Medical Reserve Corps.

Week ending September 1st.

Capt. Robert H. Ivy to Washington for temporary duty in preparation of a pamphlet on Plastic and Oral Surgery of the War.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING AUGUST 1917.

August 7.

No. 1,235,857, to ROBERT W. SWEETNAM. Casting machine.

No. 1,236,249, to WARREN M. BAECHTEL. Toothbrush.

August 14.

No. 1,236,401, to ARTHUR W. BROWNE. Dental chair.

No. 1,236,591, to ARCHELUS H. MITCHELL. Anesthetizing apparatus.

No. 1,236,878, to ANDREW J. SALVAS. Toothbrush.

No. 1,237,092, to STEPHEN PRESTON. Casting machine.

August 21.

No. 1,237,564, to OTTO SEYDEL. Napkin supporter.

No. 1,237,901, to GEORGE T. HASTINGS. Brush-holder.

August 28.

No. 1,238,210, to WESLEY L. SMITH. Artificial tooth.

No. 1,238,397, to LEO E. EVSLIN. Artificial tooth.

No. 1,238,605, to HENRY E. WEBER. Dental chair.

No. 1,238,635, to DANIEL L. CHANDLER and JOHN H. TRAYNE. Toothbrush and process of manufacturing the same.

DR. PETER K. FILBERT.

THE

DENTAL COSMOS

VOL. LIX. NOVEMBER 1917. No. 11.

ORIGINAL COMMUNICATIONS

Chronic Peridental Infections.

By JULIO ENDELMAN, D.D.S., Los Angeles, Cal.,
PROFESSOR OF SPECIAL PATHOLOGY, THERAPEUTICS, AND MATERIA MEDICA, COLLEGE OF DENTISTRY, UNIVERSITY OF SOUTHERN CALIFORNIA.

From the Laboratory of Dental Pathology, College of Dentistry, University of Southern California.

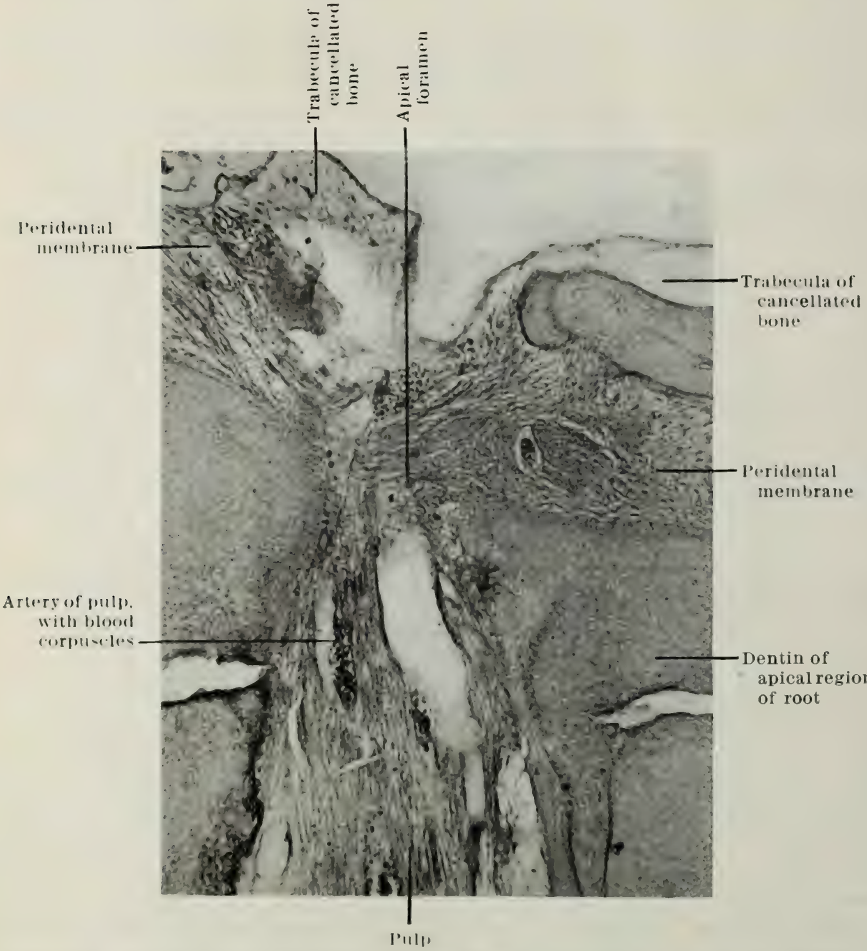
(Read by invitation at a joint meeting of the Los Angeles County Medical Association and Los Angeles County Dental Society, Los Angeles, November 16, 1916.)

CHRONIC peridental infections, by virtue of the rediscovery of the relationship which they bear in numerous instances to deep-seated intoxications, have in recent years been accorded by some members of the medical and dental professions a degree of etiolgic significance which, as a main conclusion, is by some accepted unquestioningly, while by others it is either minimized or utterly rejected.

Those who, prior to and following the publication of Sir William Hunter's essay on oral sepsis, have been gathering clinical data on the subject must doubtless share with the writer the opinion that unwarranted radicalism is evident in each group of conclusions, and that the truth will, more likely than not, crystallize into a conservative middle course, in the shape of conclusions amounting to a composite of the views of both these groups of observers. But, even then, we have to render to the focal extremists, physicians and dentists alike, the just tribute to which they are entitled, in that they have made possible the generalization of the dictum that no choice should exist as between radical dentistry and that form of conservative dentistry which retains teeth with chronically infected roots.

In the field under discussion the problem which is confronting both professions is largely one of diagnosis—accepting, as indeed we must, that at least in certain cases the source of disturbance in areas of the body beyond the field of supervision of the dentist is traceable to recurring activity in foci upon or adjacent to the roots of teeth, foci consequent upon infectious processes in the dental pulp, or of infections which originate in the gum margin and spread along the peridental membrane in a direction toward the apex of the tooth root, or contrary to those which have their starting-point in the periapical tissues.

FIG. 1.

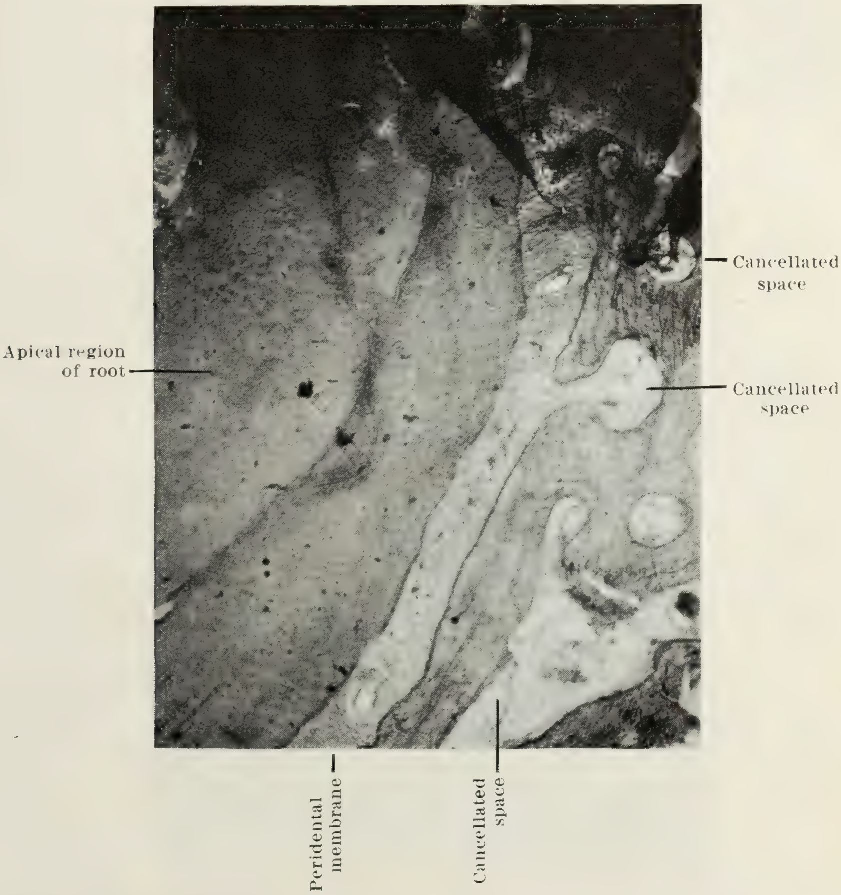

Trabecula of cancellated bone
Apical foramen
Peridental membrane
Trabecula of cancellated bone
Peridental membrane
Artery of pulp, with blood corpuscles
Dentin of apical region of root
Pulp

Apical region of tooth-root showing relationship of pulp to peridental membrane and cancellated osseous structure of the jaw. No abscess, whether acute or chronic, fails to involve the cancellated structure, whence the products of the infection are taken up by lymph and blood capillaries with consequent systemic involvement.

In the endeavor to systematize the study of chronic peridental infections we have elsewhere pointed to the advisability of classifying chronic foci of infection associated with the roots of teeth under two separate and distinct groups, because of the fact that in each group the etiologic factors, pathologic anatomy, and treatment are different.

We have suggested that under a general heading of "intra-osseous foci" should be designated those chronic infections which by a process of continuity reach the peridental membrane by spreading beyond the apical foramina of the roots of teeth, and eventually involve the cancellated bone of the alveolar process, together with the osseous substances of the jaw proper. (Figs. 1 and 2.) The chronic infections which begin in the gum margin we would designate the "extra-osseous foci." And just here may we be permitted to venture the opinion that the extra-osseous foci (the result of the infection of the gingival mucous membrane and of the peridental membrane) are, from the standpoint of systemic involvement, of at least as great if not greater importance than the intra-osseous infection?

FIG. 2.

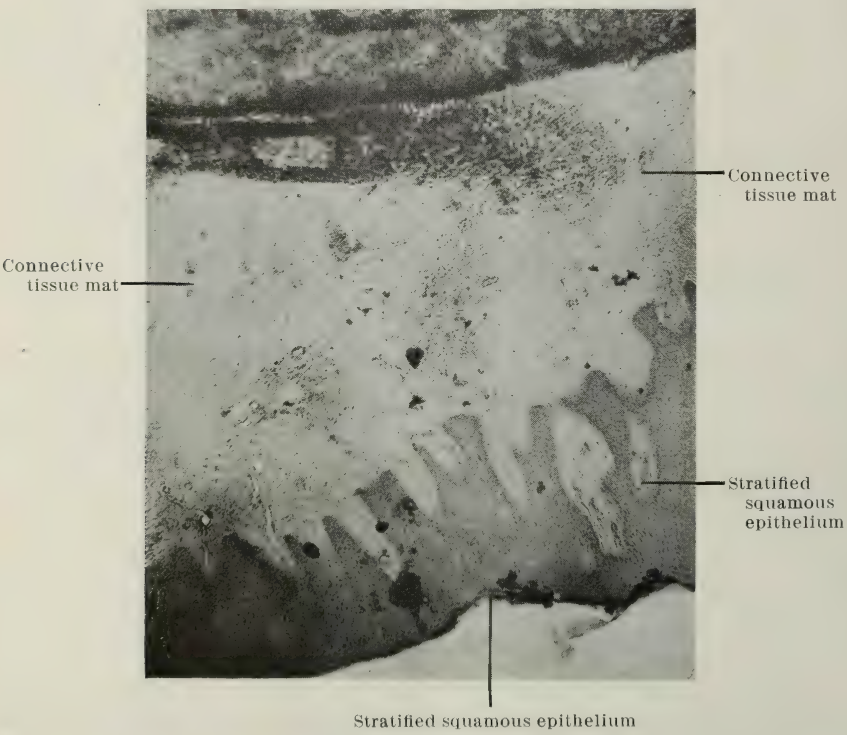


Decalcified section of apical region of root with peridental membrane and alveolar bone *in situ.* Cancellated spaces frequently open toward the root, and the myeloid substance adjoins the peridental membrane.

EXTRA-OSSEOUS FOCI OF INFECTION.

The extra-osseous foci cannot be diagnosed by means of the X-ray, and hence have attracted little attention on the part of medical and dental practitioners. It not infrequently happens that a patient in the throes of a disease of obscure etiology is referred to the radiographer. The radiographs may or may not reveal foci upon or adjacent to the roots of one tooth or of several teeth, and upon that basis a diagnosis is made. Of course, conclusions deduced from so incomplete a study of the case tell at best but a small part of the story, and in addition are absolutely mute in regard to the condition of the soft tissues, which are a prolific nucleus for the absorption of bacteria and their toxins, and therefore for the development of chronic infections in joints, muscles, heart, kidneys, lungs, etc. It has been our privilege to have under observation, during the past ten months, a series of patients suffering from arthritis, myositis, toxemia, malaise, diffused pain in the head and neck, and to find in their mouths not intra-osseous foci (chronic dento-alveolar abscesses), but what seemed at first to be mild forms of marginal gingivitis. (Figs. 3 and 4.) A course of treatment instituted with the view of eradicating the chronic inflammation in the soft tissues brought about, in a large proportion of these cases, such satisfactory results as to confirm the views heretofore ventured—that the extra-osseous infections (those which do not originate in the root-canals of teeth) have an important bearing in the etiology of some pathologic conditions which we believe are considered at the present time to be of obscure origin.

Fig. 3.


Connective tissue mat
Connective tissue mat
Stratified squamous epithelium
Stratified squamous epithelium

Normal human gingiva.

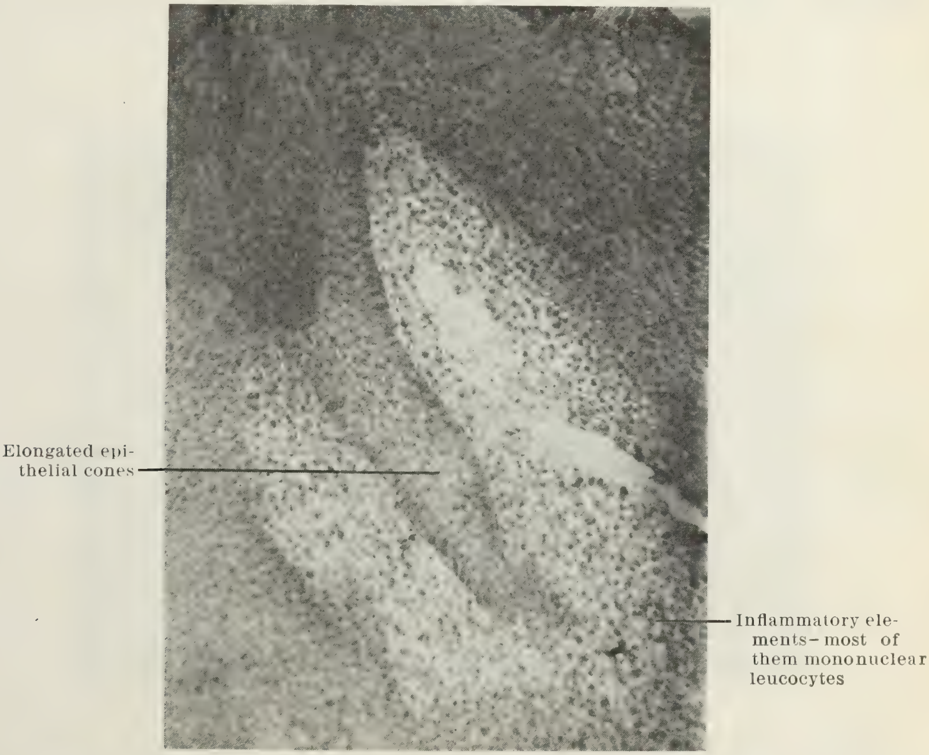
In another series of cases studied and treated with the assistance of Dr. C. C. Browning, professor of diseases of the chest, University of Southern California, the results were equally significant and satisfactory. These were cases of recurrent tubercular activity, in which some improvement invariably followed treatment directed to the gingival tissues.

It is our purpose in these remarks to emphasize the necessity of not relying exclusively upon radiographs, particularly so when secured by those whose radiographic qualifications do not go beyond a knowledge of the mere mechanics of X-ray machines. The extra-osseous foci, as far as their diagnosis is concerned, are beyond the province of the radiographer, whether he be a mechanic or a scientist. Their detection must be accomplished by visual, exploratory, and bacteriologic examinations; and the treatment instituted in these cases is a combination of surgical and therapeutic manipulations.

INTRA-OSSEOUS FOCI OF INFECTION.

Concerning the intra-osseous chronic infections or foci, our knowledge is more specific and generalized. They are the result of changes which take place in the peridental membrane following protracted infections by organisms which do not bring about *rapid* tissue destruction—either because of the resistance of the tissue involved, or because the organisms are not present in sufficient numbers, or because their degree of virulence is low. These changes are characteristic of chronic inflammations. All the specimens examined by us show practically the same anatomo-pathologic characteristics. The so-called abscess sac is a strong fibrous capsule (Fig. 5), this being composed of proliferations of preexisting fibers of the peridental mem-

FIG. 4.


Elongated epithelial cones
Inflammatory elements—most of them mononuclear leucocytes

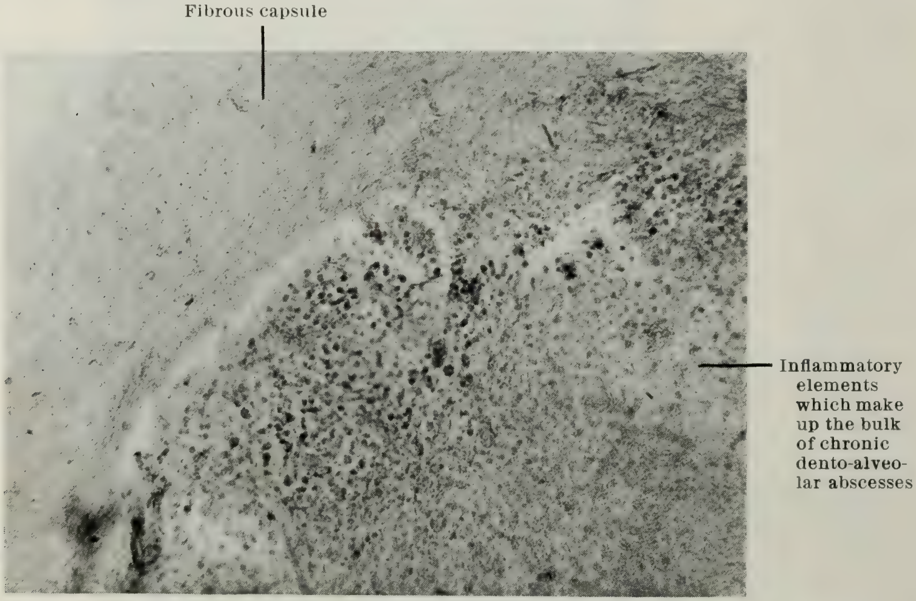
Human gingiva the seat of a chronic inflammation. On clinical examination the gingiva appears slightly redder than normal. The disappearance of systemic symptoms has followed the return of the gingiva to a condition of health upon removal of sources of irritation at the necks of the teeth. Observe the elongated character of the epithelium between the connective tissue papillæ which is typical of irritated epithelium.

brane. (Figs. 6 and 7.) Within the sac the identity of the fibers of the peridental membrane is lost, or practically so, this tissue being replaced by inflammatory connective tissue elements and by fibroblasts of repair, and in addition a rather liberal supply of bloodvessels is present immediately adjacent to and within the fibrous sac. The bulk of a chronic dento-alveolar abscess is made up of such inflammatory cells as mononuclear leucocytes in large numbers; polymorphonuclear leucocytes in restricted numbers, plasma cells, and fibroblasts. (Fig. 8.) The capsule does not necessarily mark the boundary of the abscess; beyond the capsule the author has found a continuation of the abscess. (Fig. 9.) Trabeculated abscesses are not uncommon, two or more compartments entering into the formation of one single chronic dento-alveolar abscess (also see Fig. 9).

In Figs. 10 and 11 are shown decalcified longitudinal sections of cementum with normal peridental membrane attached. They are exhibited for the purpose of comparison with structures shown in pathologic sections—see Figs. 5, 6, 7, and 9.

These abscesses in several instances, when planted without in any way disturbing the capsule, for purposes of inoculation, produced no growth in the artificial media usually employed for that purpose; when cultures were made with their tissue-contents, luxuriant growths followed. These results may serve to explain why, in some patients with one or more chronic dento-alveolar abscesses, no systemic involvements develop. The reparative processes of the body have evidently established a barrier around the bacterial exciters, and by a process not altogether dissimilar to that which occurs in pulmonary tissue, the lesion is rendered passive. However, we may remark that this passiveness is only temporary, and one which in no way warrants a

Fig. 5.


Fibrous capsule
Inflammatory elements which make up the bulk of chronic dento-alveolar abscesses

Section of chronic dento-alveolar abscess, so-called dental granuloma, showing the fibrous capsule (upper left-hand corner of the picture). It is only partially formed by pre-existing fibers of the peridental membrane, the bulk of the fibers representing proliferations from that source.

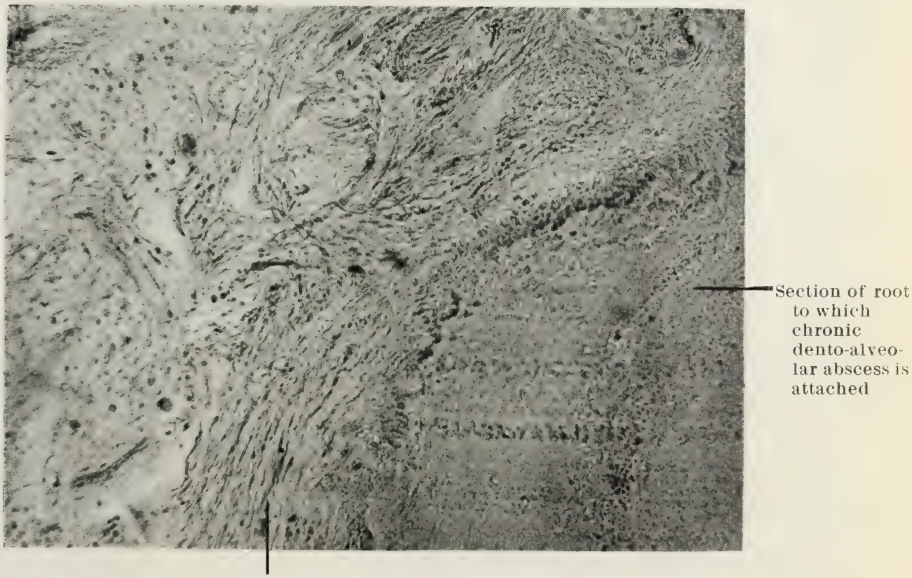
neglect of the lesion; for, much as obtains in the case of pulmonary fibrosis, a decrease in body resistance may bring about *renewed* bacterial activity and the breaking down of the capsule, with consequent secondary infections in joints, muscles, kidneys, heart, stomach, intestines, etc.

ROOT-CYSTS.

Chronic peridental infections, more often than might be surmised, result in the development of root-cysts which remain quiescent for a time, and then, becoming infected, break down. After discharging, the cysts may re-form, or a sinus may become established leading from the tooth to the gums.

As intimately related to the question under consideration, particularly in its bearing upon systemic manifestations, a reference here to the character of the lesions produced in the hard tissues of the tooth and of the alveolar bone may not be considered superfluous. The peridental membrane, very similar in its histological elements to periosteum, is a tissue with dual functions. It fulfils periosteal functions to the alveolus of the tooth upon its *external* aspect, while upon its *internal* aspect it performs similar functions to the cementum, or that bone-like structure which is an integral portion of the tooth root—its bony envelope, so to speak, which extends from the gum margin over the entire area of the root. The cementum depends entirely for its blood and nerve supply upon the peridental membrane, the fibers of which penetrate the alveolar bone at one extremity and the cementum at the other.

Fig. 6.


Section of root to which chronic dento-alveolar abscess is attached
Fibroblasts and fibers which have proliferated from the fixed fibers of the peridental membrane

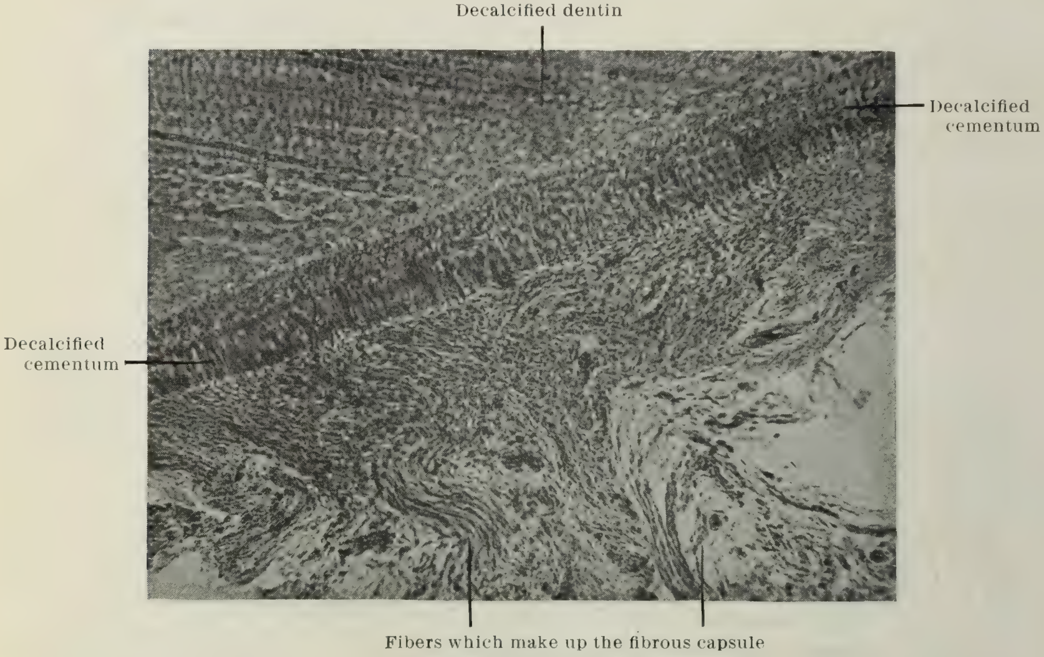
Decalcified section, slightly diagonal to the long axis of the root, showing the fibrous capsule at the area of connection with the root. The identity of the fibers of the peridental membrane is lost; instead, fibroblasts in large numbers are to be seen.

CHRONIC DENTO-ALVEOLAR ABSCESS.

A chronic dento-alveolar abscess brings about the destruction and detachment of groups of these fibers, and, in consequence, areas of cementum are deprived completely of blood supply, and undergo necrosis; and again, as the cementum has no blood-vascular system of its own, the phenomenon of sequestration, as it occurs in bone, does not materialize in cementum. The retained areas of necrosed cementum maintain in the adjacent peridental membrane a state of chronic inflammation, subject to occasional exacerbations. The tendency of the body to rid itself of substances foreign to it is exemplified in this connection in the root absorptions which occur in conjunction with chronic alveolar abscess. The process of pathologic absorption is extraneous to the root. (Figs. 12 and 13.)

It will thus be seen that a chronic dento-alveolar abscess upon a root which has existed for some time is, in most cases, in a condition incurable by medicinal means *only,* although its eradication may, in selected cases, be brought about by the surgical removal of the affected areas of the root. The lesion in the cancellated bone of the jaw is of the character of an osteomyelitis—affecting, as it does, the osseous structure as well as the myeloid substance in the cancellated spaces—and is accompanied by bone rarefaction. (Fig. 14.)

FIG. 7.



Decalcified section in which are clearly seen the fibroblasts which have proliferated from the pre-existing fibers of the peridental membrane and which go to form the fibrous capsule of a chronic dento-alveolar abscess.

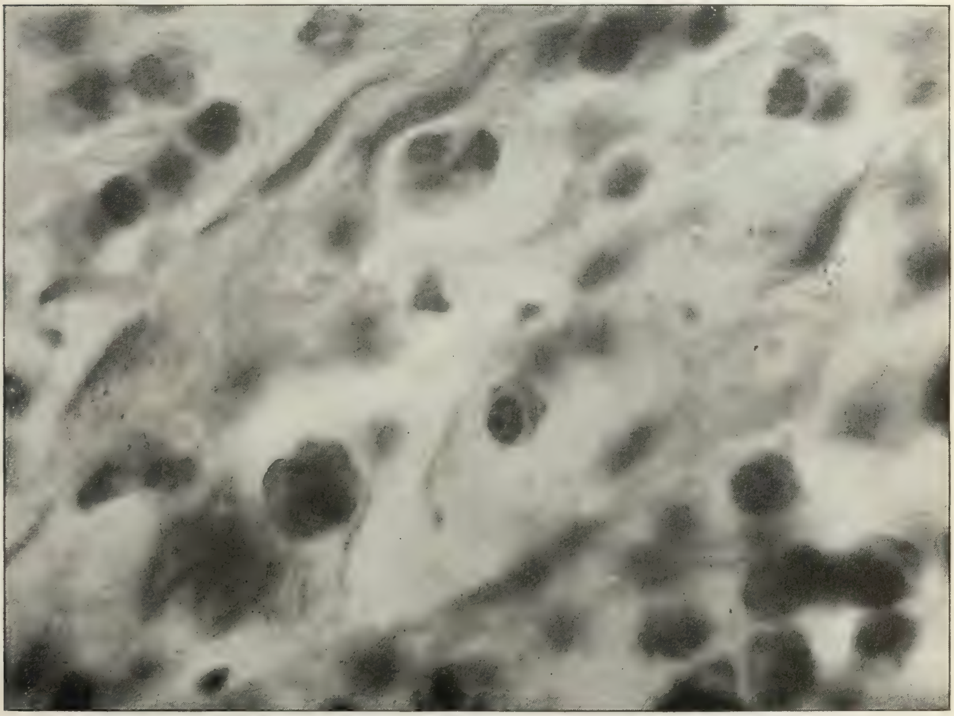
PERIAPICAL INFECTIONS.

Infections of the periapical tissues of course invariably lead to varied degrees of involvement of the surrounding bony structures. The pathologic process which originates within the alveoli spreads to the cancellated substance of the jaw, exhibiting the characteristics of an osteomyelitis, but with no tendency, except rarely, to spread. The cortical bone lining the alveoli soon breaks down as the result of the infectious process in the peridental membrane, and upon the establishment of a passage through the cortical layer at any particular point the infection reaches the cancellated substance of the alveolar walls—which is, of course, continuous with the cancellated substance of the jaw proper. The absorption of the cortical bone of the alveoli in the course of an infectious inflammation is probably due to the combined action of osteoclasts and of leucocytes, it having been satisfactorily shown by a number of investigators that the presence of osteoclasts is not essential in the absorption of bone. (Ribbert.*)

The medullary substance in the cancellated spaces becomes the seat of an inflammation in which osteoclasts play an active part. Through osteoclastic and leucocytic action as previously noted, the hard substance of the bone, viz, the walls of the cancellated space, disappears; the cancellated spaces are, so to speak, eaten through, and the Haversian canals are made wider. The contents of the spaces, viz, the medullary substance, become the seat of an acute inflammation in which the cellular elements typical of this form of inflammation are present. In time the inflamed medullary substance breaks down. In some places the cortical layer of the alveoli is less than one-third of a millimeter in thickness. Its involvement and disappearance in the direction of thickness is therefore quickly brought about, thus opening an abundance of avenues for the absorption of bacterial toxins.

Acute or chronic apical infections cannot be regarded from the viewpoint of localized infections. If all acute or

FIG. 8.



Inflammatory cells in chronic dento-alveolar abscess. The mononuclear leucocytes predominate.

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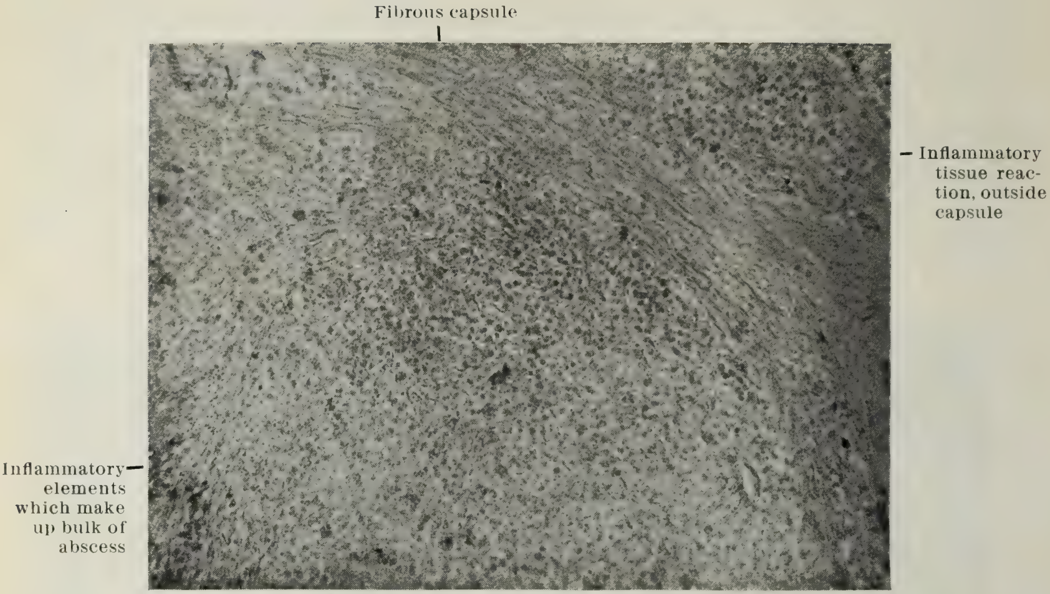
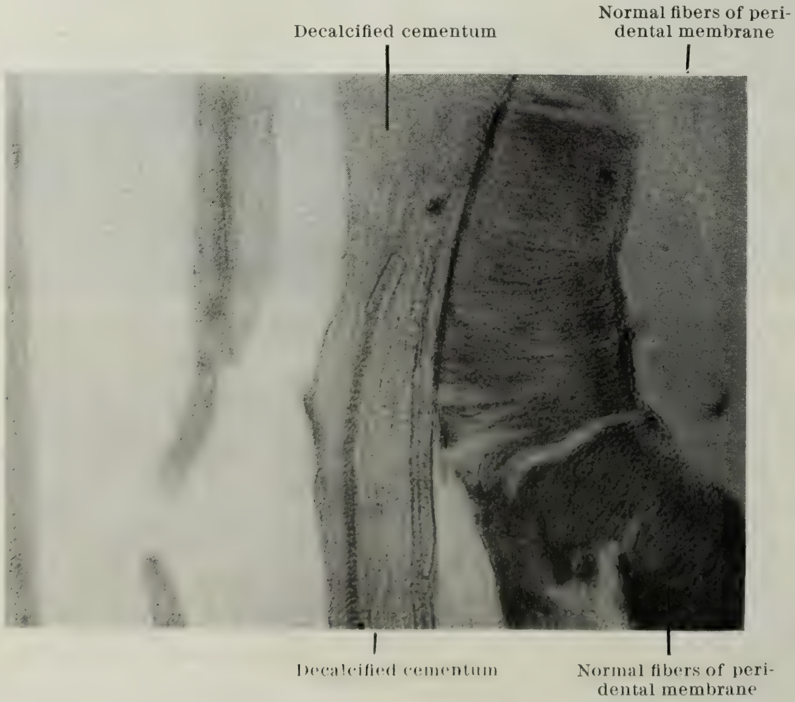
* Adami and McCrae, "Text-book of Pathology."

FIG. 9.


Fibrous capsule
Inflammatory tissue reaction, outside capsule
Inflammatory elements which make up bulk of abscess

Section showing that the capsule does not always mark the boundaries of the abscess. Chronic dento-alveolar abscesses are frequently trabeculated, two or more compartments entering into the formation of one so-called abscess sac.

FIG. 10.


Decalcified cementum
Normal fibers of peridental membrane
Decalcified cementum
Normal fibers of peridental membrane

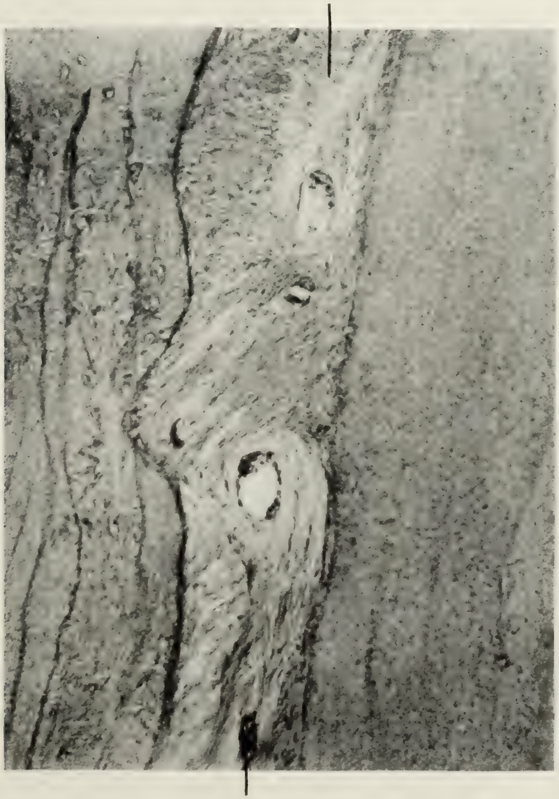
Normal peridental membrane, shown here for the purpose of comparison with structures shown in Figs. 5, 6, 7, and 8.

chronic infections of the periapical tissues do not give rise to systemic manifestations, it is not because the products of such infections are not in all cases beyond the portals of absorption, but because the individual is able to combat successfully the bacterial invasion. Osteomyelitis is a destructive lesion involving the periosteum, the cortex, and the marrow.*

The staphylococcus seems to be the predominating bacterium in these lesions, although other organisms may bring about the same results in associations with the staphylococcus, viz, the pneumococcus and the typhoid bacillus. The bacteria invading the cancellated spaces produce an inflammation of the medullary substance, viz, a myelitis. The cells of the medullary substance, around the focus of infection, are destroyed and their places taken by leucocytes which liquefy the necrotic tissues and attack the bony lamellæ, which they reduce to fragments.*

When liquefaction is not complete, owing to a more slowly progressing infection, and when osteoclastic activity has taken place beyond the area of involvement, the mass of disintegrated bone may

Fig. 11.



Normal peridental membrane. Compare appearance of fibers with those shown in pathologic specimens in Figs. 5, 6, 7, and 8.

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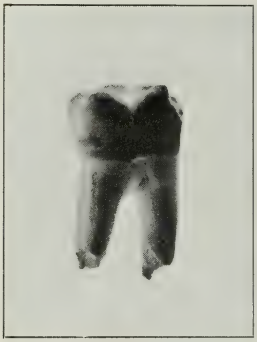
* MacCallum, "Text-book of Pathology."

* MacCallum, *ibid.*

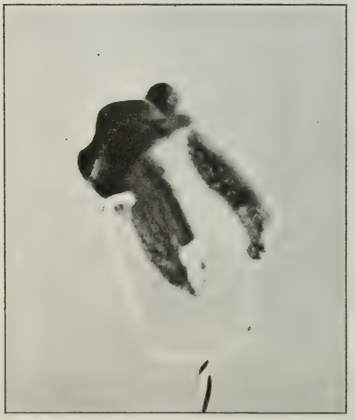
become separated from the surrounding healthy bone in the form of sequestrum.

Fig. 12.



Root absorption in chronic dento-alveolar abscess.

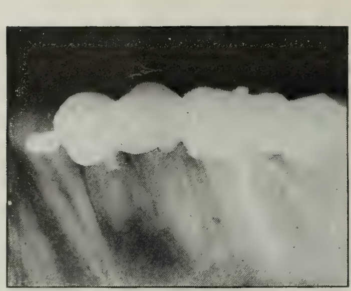
Fig. 13.



Root absorption in chronic dento-alveolar abscess.

These phenomena are, by means of the X-ray, the only available index of the degree of penetration and intensity of the septic processes arising from foci of infection in root-canals and peridental structures, inasmuch as the radiograph is an indicator of *degrees* of density—so that the less dense the bony structure, the greater the opacity shown on the film or plate. But radiographs of the teeth are available only as they are secured by radiographers who have knowledge of the anatomy, physiology, and pathology of the mouth, and when used in conjunction with other methods of diagnosis, viz, the history of the case, clinical examinations, and laboratory findings. We must lay particular stress upon the imperative duty of not placing the entire burden of diagnosis upon the radiograph, and of securing in doubtful cases three or more films exposed at different angles before any attempt is made to reach the conclusion upon which subsequent treatment is to be based.

Fig. 14.



Alveolar rarefaction the result of osteomyelitis in chronic dento-alveolar abscess.

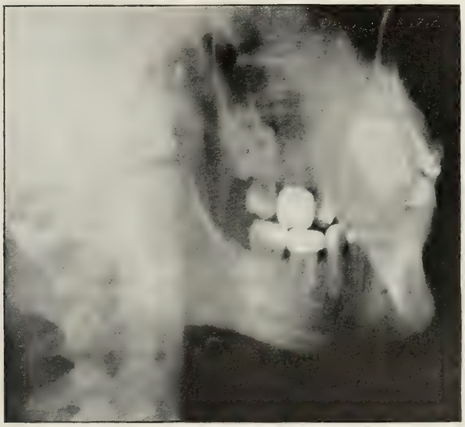
CASE REPORTS.

The following cases were studied in collaboration with Dr. James D. McCoy, whose painstaking work in dental patho-radiography has been of the greatest assistance in our work:

Case No. 1.

Woman of thirty-six years, who had hitherto been in apparently good health, complained of acute pain in her face, and, in addition, of a series of symptoms typical of a general toxemia. She seemed anemic and decidedly below par. She sought the services of a dentist for the purpose of ascertaining whether any abnormality could be detected in her teeth that would account for the reflex pain from which she had been suffering for some time past. An area of osteoporosis was found around the root of the lower second biscuspid (Fig. 15), indicative of chronic sepsis in the peridental tissues and within the bony structures. The tooth had been previously treated and the root-canal carefully filled. The bicuspid was extracted, and almost immediately the pain and toxic symptoms began to improve, and have continued to do so uninterruptedly.

FIG. 15. (*Case 1.*)

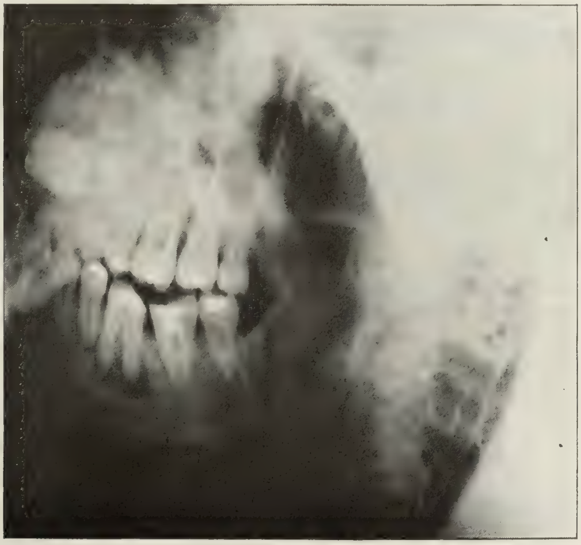


Focus of infection around the root of the lower second bicuspid.

Case No. 2.

Man of forty-five years, who gave a history of continued good health up to the time of the incidence of the symptoms which led to his being placed under our observation. He had evidently been of vigorous constitution and athletic tendencies. He complained of lack of appetite, lassitude, inability to exert himself to any extent without experiencing a sense of fatigue. The radiograph showed a marked chronic septic condition under the roots of the lower first molar (Fig. 16), which tooth evidently had been treated years previously, and in which the root-canals had not been filled. There was a tenderness to percussion in several teeth, and consequently a definite diagnosis could not be made at the time. The radiograph came to our assistance, the offending tooth was extracted, and a complete recovery followed within a period of three or four weeks.

FIG. 16. (*Case 2.*)



Focus of infection under roots of lower first molar.

Case No. 3.

Man of about sixty-five years. This case seems to present features of special interest because the septic conditions about the roots of some of the teeth were evidently responsible for an interruption in the mental balance of the patient. The man, of limited means, had endeavored for some time past to secure a berth in an old men's home, but on account of the mental and physical symptoms the authorities of the institution rejected his application. He was referred to us by his physician to ascertain whether an abnormality could exist in his jaws and around his teeth which could be held to account for the toxic symptoms from which he was suffering, and also for the disturbance in psychic function. We found what would warrant us in assuming that the foci of infection in his jaws were at least a factor in the production of the pathologic symptoms herein described. All the teeth that were considered responsible for the development of foci of infection were extracted, and the improvement that followed was so marked that he was permitted to become a member of the household in the institution to which admission had been denied him some months previously.

Case No. 4.

Woman of thirty years. This patient had exhibited symptoms of intense toxemia for a number of months. Prior to the onset of these symptoms, she reported, she had been in good health. She was referred to us to ascertain whether the condition of the lower first molar, which had been treated and the root-canal filled, was satisfactory. Suspicion had been aroused because the tooth was slightly tender to percussion. While a slight abnormality was detected, the main difficulty was found, however, in the second bicuspid. This patient was in such an exhausted condition as to require anywhere from sixteen to twenty-four hours sleep per day, and even after such a long period of quietness she would awake with a feeling of fatigue as intense, so it seemed, as at the time of retiring. The lower second bicuspid was extracted, and in the course of a few weeks the symptoms entirely disappeared. She has since reported that eight hours' sleep satisfies her completely.

Case No. 5.

Man of about forty-five years, with symptoms of toxin absorption and slight pain on the left side of the mandible. A large septic focus was found between and below the roots of the lower first molar. Extraction was followed by recovery.

CONCLUSIONS.

In closing, the following conclusions are offered:

(1) The presence of chronic infections, *extra*-osseous or *intra*-osseous, is a constant menace to the general health.

(2) While all patients treated by the surgical removal of intra-osseous foci do not improve, a sufficiently large number show such marked improvement as to indicate the necessity of eradicating these foci of infection wherever present, and whether in one single tooth or in several teeth.

(3) Once a diagnosis of chronic intra-osseous foci has been established by means of correctly secured radiographs, plus the history of the case and clinical examinations, and therapeutic treatment persisted in for a reasonable time fails, the affected roots should either be extracted or the necrosed root areas excised.

(4) Extra-osseous chronic infections play an important rôle, as important at least as the intra-osseous foci, in the causation of deep-seated chronic infections. These extra-osseous foci cannot be diagnosed by means of the radiograph, and may be present or not in conjunction with intra-osseous foci.

(5) If radiographs do not show intra-osseous foci, it does not prove that extra-osseous foci are not present. The patient should then be examined clinically, and a diagnosis made upon the evidence thus secured.

(6) Chronic alveolar abscesses, and particularly root cysts, are in most instances incurable by medicinal means.

(7) The best interests of patients will be served by the sympathetic co-operation of physician and dentist. The dentist lacks in that which the physician can supply, and *vice versa.*

(8) The dooming of a series of teeth to extraction on the basis of the evidence secured from a series of radiographs, often the work of X-ray mechanics, and without dental advice, is to be emphatically condemned.

(9) The dental profession in its fight against focal infections solicits the assistance of the medical profession especially in regard to the prophylaxis of dental caries, the original cause for the development of these foci. With dental caries abolished, intra-osseous foci must go; the existence of the latter would be an impossibility in the absence of dental caries. Examinations of the mouth with reference to the condition of the soft tissues—the investing tissues of the teeth—carried on at reasonably frequent intervals, will to a large extent do away with extra-osseous foci.

A Study of the Enamel, with Special Reference to the Lines of Schreger.

By E. BALLARD LODGE, D.D.S., Cleveland, Ohio.

IF a thin vertical radial section of enamel be cut and polished and placed under a low power of the microscope, light and dark lines will be observed radiating from the dento-enamel junction toward the periphery of the enamel. These lines are known as the lines of Schreger. With reflected light only, the lines appear of a bluish or slaty color and the intervening areas appear white; while with a very small admixture of substage light the dark bands are seen to be areas of considerable translucency and the interspaces are opaque white.

If a vertical radial section of enamel in a solid block be examined—in which case we could, of course, have no transmitted light, but only reflected light—the lines can be definitely seen, but they will appear of a dark color and will be lacking in the bluish quality seen in a thin section with reflected light only.

VARIOUS OPINIONS REGARDING THE LINES OF SCHREGER.

There has been considerable discussion as to the cause of these interesting phenomena. Tomes, quoting from Von Ebner, says: "There is another class of markings seen upon the surface of a section of enamel, known as Schreger's lines. These are dependent upon the different directions of contiguous groups of prisms, and can be seen only by reflected light, and then only in longitudinal sections; by transmitted light they are quite invisible."

Preiswerk ("Atlas and Text-book of Dentistry," page 75) has this to say: "The lines of Schreger are alternating dark and light bands with regular interspaces, which traverse the enamel toward its surface in such a manner as to give it a striated appearance. These lines are not colored, for by azimuthal rotation of 180 degrees the dark bands become light and the light dark (as determined by Czermac). Their occurrence is considered by Linderer, with whom Koelliker and Von Ebner agree, to be due to alternating uniform curvatures of the prismatic bundles."

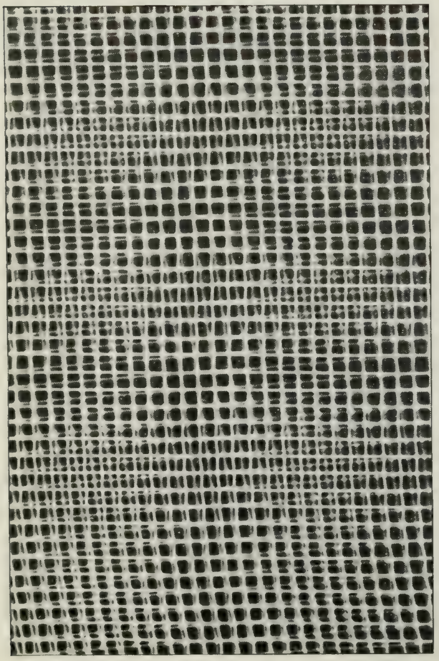
Referring to Broomell and Fischelis ("Anatomy and Histology of the Mouth and Teeth," page 357), we may read: "Still another set of lines or markings is to be observed in the substance of sections of enamel by reflected light, the same being quite invisible by transmitted light. The presence of these lines is due to the various directions assumed by contiguous groups of enamel rods. Beginning at the surface of the dentin they are well defined, but gradually become less marked as the exterior of the enamel is approached."

Pickerill (DENTAL COSMOS, October 1913, page 981), in accounting for Schreger's lines, says they "are caused by differences in optical density of contiguous groups of prisms running in directions sometimes apparently at right angles to each other."

THE LINES OF SCHREGER DUE TO DIFFERENCE IN OPTICAL DENSITY OF THE TISSUES.

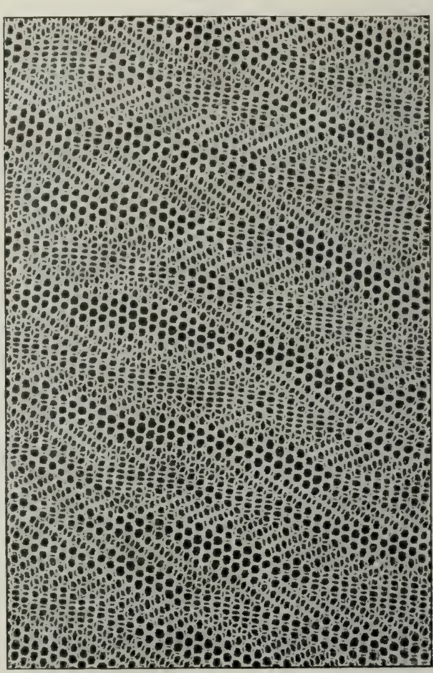
I believe that the production of the lines is due to the difference in optical density, which latter, in turn, is due to the creation, in effect, of one or more nets produced incident to the making of the section. If a thick section of enamel be made, we have in effect, one net, whereas if we have a thin section, thin enough to be translucent, we have, in effect two nets—one corresponding to each plane surface. It makes no difference, so far as the principle of the line development is concerned, whether the mesh of the net be hexagonal, pentagonal, square or any other pattern, so long as we have one superimposed upon the other as in the case of a thin section of enamel, with proper adjustment of light and shade; or whether we have only one net and its shadow upon a closely placed shadow-receiving screen. This latter condition we have in a thick block of enamel with one plane and polished surface. While the vertical radial section, running as it does in the general direction of the long axes of the rods, may be more vivid and distinct, it is also true that these optical effects may be seen also in other sections. In a vertical parallel section, *i.e.* one parallel to the surface of the enamel, the lines can be seen and, as would be expected, are found to run in more or less parallel courses.

FIG. 1.



In this experiment two pieces of ordinary fly-screen were placed one upon the other, and the two were placed upon a printing-frame over sensitized paper and exposed to light, and the print developed. We have here an analog to the lines of Schreger.

FIG. 2.

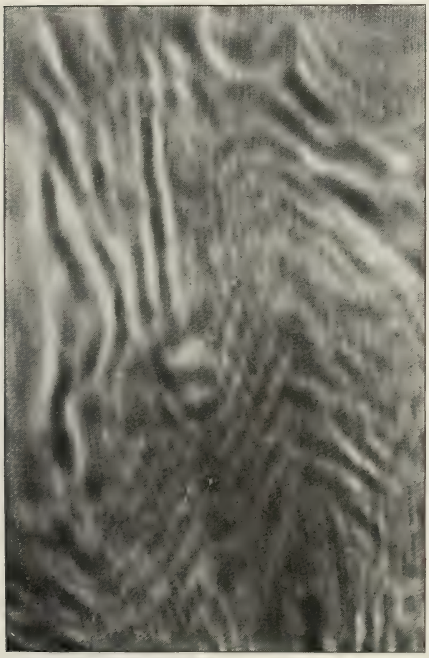


This is the result of placing two thicknesses of ordinary black cotton net over a printing-frame as in Fig. 1, and exposing to light and developing the print. Here again we are furnished with an analog to the lines of Schreger.

PICKERILL'S VIEWS.

Pickerill has beautifully shown that the single enamel fiber runs the whole distance from the amelo-dentinal junction to the periphery, and that supplemental fibers are not present, and are not required to fill out the larger space occupied by the enamel surface. He shows by actual photographic measurements that the amelo-dentinal end of the fiber is, on the average, 0.0031 mm. in diameter, and the peripheral end is 0.0057 mm. They vary, then, in their diameter at opposite ends in a ratio of 1 : 1.83, *i.e.* are nearly twice as wide at the surface end as at the dentinal end. This fact, I believe, accounts for the widening out of the bands and spaces of the lines of Schreger in a vertical radial section, and the essentially parallel arrangement seen in a vertical parallel section. In the former it is obvious that the prism mesh patterns must gradually increase in width as we proceed from the amelo-dentinal junction toward the external surface, while a section across the prisms at right angles to their long axes would result in patterns of about the same size. These features may be readily simulated by a simple experiment. Take a silk stocking and hold it in both hands, stretching the fabric taut with both thicknesses in close apposition, and hold it before the light. If one side be stretched wide and the other stretched less taut to diminish the size of the mesh and held up before the light, we have a good analogy of a thin vertical radial section of enamel as viewed under a low power of the microscope with a combination of reflected and transmitted light. The fantastic light and dark striations are identical effects with the lines of Schreger, and are produced by like conditions. (Fig. 3.)

FIG. 3.



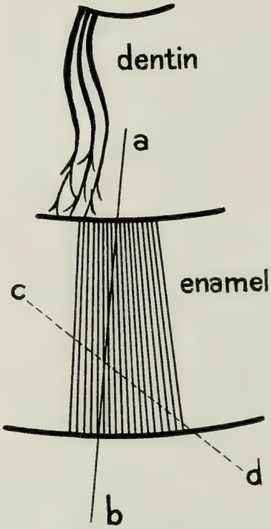
This illustration was secured by exposing a sensitized paper behind two thicknesses of silk hose, following up the same as in the preceding experiments. This analogy is perhaps better in some respects than those of Figs. 1 and 2. The lines run in various directions due to the unequal stretching of the fabric. These efforts at illustrating reticulum optical effects are less satisfactory than the phenomena exhibited by merely viewing these nets by a subdued transmitted light. This, especially with the silk hose, yields fantastic Schreger lines.

PREISWERK'S VIEWS.

Referring to the quotation from Preiswerk in which he says: "By azimuthal rotation of 180° the dark bands become light and the light dark," the present writer would suggest that this phenomenon can be well represented by the following experiment: Take three pieces of ordinary fly-screen about eight inches square. Two would do, except that the mesh is a little large for the experiment and using three pieces is equivalent to reducing the size of the mesh if laid one upon the other slightly out of alignment. Now, if the experiment be done by daylight, place the three pieces of screen against the windowpane and hold by placing the index finger against the center of the screens. Stand at an angle to the plane of the screens 15° to 30° or more from the perpendicular, and note the optical bands. Place a tiny piece of paper securely upon a light band, rotate the whole 180°, and note that the paper is now over a dark area. (Fig. 1.)

If this experiment be undertaken by artificial light it may be done as follows: Place the three pieces of fly-screen together as in the former experiment. Lay them upon a piece of white paper under a strong light. Rotate 180° as in the former experiment, and the same phenomena will be observed with the exception that here we have reflected light only, while in the previous experiment we had a combination of transmitted and reflected light.

FIG. 4.



In the accompanying diagram the line *a b* represents the plane of a vertical radial section of enamel, in which myriads of prisms are necessarily cut, thus producing the effect of a net. In such a section Schreger lines will be seen running from the amelo-dentinal junction toward the periphery, but not all the way across the section. Cut the same block of enamel in the plane represented by the line *c d*, and the lines will be continued to the enamel surface.

In a vertical radial section of a tooth, myriads of enamel rods are necessarily cut. It is inconceivable how, even though the rods were perfectly straight, that this cutting across diagonally could be avoided. Near the amelo-dentinal ends the rods are bundled together in "alternating uniform curvatures," while at the surface end of the rods they are nearly straight. By this condition we have, in a vertical radial section, cut the enamel prisms in a way to produce net patterns of short oblique and long oblique rod sections. In other words, some rods are cut at an angle approaching a right angle to their long axis, while others are cut at an angle almost in the same plane with the long axis, according as we examine the tissue at the dentinal end or the distal end of the rods respectively. This the writer believes to be the reason why the lines are lost to view in the vertical radial section as we approach the periphery of the enamel. In this area the mesh patterns are wanting, and in their stead are presumably ribbon-like areas corresponding to the very slight angle, perhaps an angle of two or three degrees to the long axis of the fiber at the peripheral one-third of its length as compared with sections of 45°

FIG. 5.

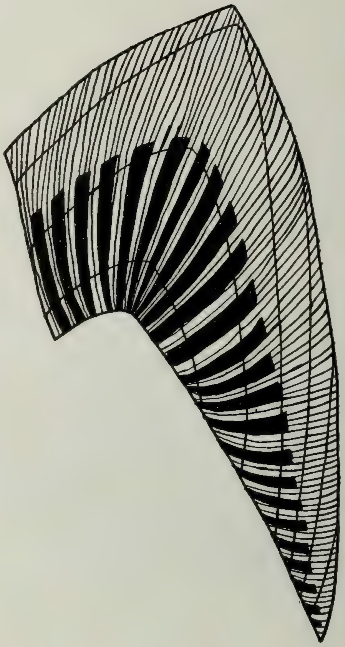
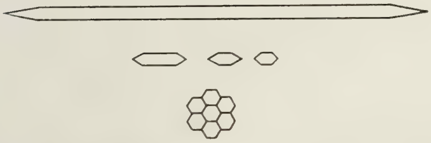


Diagram of a vertical radial section of enamel. Heavy dark lines represent the lines of Schreger. They are, as a rule, curved, and follow the general course of the enamel rods. Toward the periphery the lines are lost to view.

or more at the dentinal two-thirds of the rod's length. For a clearer understanding of this the reader is referred to the diagrams in Fig. 6.

Just here in the writer's study of this subject the suggestion presented itself that if this theory is correct—viz, that the lines of Schreger are due to difference in optical density, which in turn is caused by the creation, in effect, of one or more nets, and these made incident to the making of the section—then, other conditions being the same, we should, on making a section of the same block of enamel at an angle of about 45° to the plane of the vertical radial section and in its outer portion, get the phenomenon of Schreger's lines all the distance to the periphery.

FIG. 6.



This represents, diagrammatically, enamel prisms cut at varying angles, thus producing varying mesh patterns. A good way to facilitate the understanding of this is to imagine a six-sided lead pencil cut at the different angles.

This section was carefully made with a result precisely as was to be expected, viz, the lines were made visible all the way to the periphery. Why was this so? Because in the latter section we had produced net patterns due to the crossing of myriads of enamel fibers similar to the short patterns at the dentinal end, at which end the fibers are in "alternating uniform curvatures" and consequently short patterns in the vertical radial section are seen, as in Figs. 4 and 6.

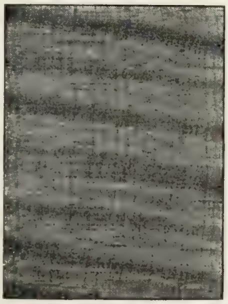
THE INFLUENCE OF SUSCEPTIBILITY AND IMMUNITY TO CARIES IN ENAMEL ON THE APPEARANCE OF THE LINES OF SCHREGER.

Just at this point it seems necessary to say that it is probable, in the writer's opinion, that there exists a difference in enamel immune to caries and enamel susceptible to this disease which would involve a difference in the appearance or non-appearance of Schreger's lines.

It is quite conceivable that the optical density of the material constituting the rods and the interprismatic substance being so nearly equal, that the lines would not appear, even though the sections should otherwise be such as should produce mesh patterns. If these densities to light were in a given case equal, or nearly so, it would necessarily give the enamel a homogeneous appearance.

I have thus far examined only teeth susceptible to caries. In this field may be rewards not merely in the fascinating realm of pure science, but such study may in fact afford a link in the chain of practical science in the more perfect understanding of the cause of immunity and susceptibility. We may state, then, a corollary—that if, on making a vertical section at a 45° angle to the long axis of the prisms the lines were not revealed, the conclusion would then be forced that the refractive index of the interprismatic substance to the rods was too nearly equal.

FIG. 7.



This illustration is taken from a smooth piece of curly maple obtained from a violin-maker. This wood is used in the necks and backs of violins. A split piece shows the grain to be arranged like the enamel fibers, viz, in alternating uniform curvatures. The notable thing is that, unlike the enamel striations, these bands in the maple run crosswise of the grain instead of with it.

We have seen that several eminent histologists have agreed that the lines of Schreger are due to "alternating uniform curvatures of the prismatic bundles." To accept this as final cannot be permitted, since it is in direct conflict with an analogous natural phenomenon.

This analogy is found in the vegetable kingdom—viz, the curly maple, used in furniture and specially prized for its beauty and other qualities in the backs and necks of all of the best violins since the time of Stradivari. This wood is composed of fibers in "alternating uniform curvatures." The undulations in the fibers of this wood are in identical relation to the grain that the undulations of the enamel fibers are to the grain of that substance, *i.e.* the direction of the long axis of the fibers—the direction in which it cleaves. Now, in the case of Schreger's lines, they run in the direction of the long axes of fibers, while in the case of the maple the striations run at right angles to their long axes. (See Fig. 7.)

In one sense, however, the "alternating uniform curvatures of the prismatic bundles" do contribute to the lines of Schreger, and this in a location where, except for these undulations, they could no more be seen in the vertical radial section (and by this the writer speaks of a section strictly in line with the long axis of the prisms) than they could be observed in the same section where the undulations are wanting—viz, at the exterior ends of the fibers.

The true cause then, the writer believes, lies in the fact that, due to the translucence and the prismatic structure of the enamel, net effects are produced in enamel sections which—owing to the regularity of their patterns and their mesh patterns being superimposed one upon the other—develop areas of light transmission in parts where the mesh patterns are in apposition, and of light obstruction in parts where the mesh patterns come in interference. This holds true in a thin section of enamel viewed with a combination of reflected and transmitted light, and examined by low power.

The lines of Schreger in the enamel have been likened to the fantastic bands seen by the superimposition of various kinds of nets and viewed both by reflected and transmitted light. Still another analogy may be cited—namely, the familiar effect produced by viewing two parallel and closely built picket fences from a rapidly moving conveyance. Here, again, we should have light and dark bands, which in such an instance would appear in rapid motion.

SUMMARY.

(1) The lines of Schreger in the enamel are due, in the opinion of the writer, to net effects produced by light falling upon the cut enamel prisms and the optical densities varying according as the mesh of these nets are in apposition or in interference.

(2) The lines of Schreger may be simulated by placing two wire screens together and viewing over a white surface or by subdued transmitted light; or by two layers of fabric, as silk hose or other net, held before the light.

(3) The experiments performed by Czermac can be simulated with the wire screens for effects produced by azimuthal rotation of 180°, light areas becoming dark and dark areas light.

(4) The lines of Schreger are wider at the periphery than at the amelo-dentinal ends by a ratio comparable to the diameter of the rods at these ends respectively.

(5) Where the section is essentially parallel to the long axis of the enamel fiber and where the tissue is nearly straight, the lines are difficult to see; but when a section of the same enamel is made at about 45° or more to the first-made section, mesh effects are produced that result in Schreger lines reaching to the periphery.

(6) Pigment in the enamel has no part in the production of Schreger's lines.

(7) These lines are visible in cut and polished vertical radial sections and in parallel sections (that is, sections parallel to the surface of the enamel) and even in split sections by reflected light and in thin sections by subdued transmitted light.

(8) Following the suggestion of Pickerill that the striæ of Retzius be called "incremental lines," the present writer recommends that the lines of Schreger be called "reticulum lines."

432 Rose Bldg.

Focal Infection.

By ALONZO MILTON NODINE, D.D.S., New York, N. Y.,

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LATE ORAL AND DENTAL SURGEON HÔPITAL FRANÇAIS DE NEW YORK, PASSY-PAR-VERON (YONNE), FRANCE.

(Address given before the Four States Postgraduate Dental Meeting (Ala., Miss., Texas, La.), at New Orleans, La., June 5, 1917.)

FOCAL infections from the ends of the roots of teeth are among the most certain, frequent, and insidious underminers of health that we know, and for the following reasons:

(1) These infections may and most frequently do occur without giving rise to any local pain or discomfort.

(2) Foci exist about the roots of teeth which have been supposedly well filled.

(3) Systemic effects are produced so gradually that the person thus afflicted is not conscious of any departure of his health from the normal.

(4) The presence of such foci of infection is usually not revealed except by either accidental or intentional diagnosis with the X-ray.

(5) Often these infections exist about the roots of septic teeth without giving any radiographic evidence of their presence or manifesting any local symptoms.

(6) The effects of these local infections are produced so remotely, both in time and in place, from their origin that there is no apparent connection between the two.

(7) There is hardly a person over twenty-five years of age, who has had dental treatment in which the pulp has been involved who has not one or more of these apical infections. The older the patient and the more dental attention received, in the form of crowns, bridge work, and the removal of devitalized pulps, the more foci of infection he may have.

(8) These infections are the ones most puzzling to the oral surgeon and diagnostician, and the ones requiring his most skilful efforts to eradicate.

A few years or more ago physicians gave little or no attention to the influence of the teeth on their patients' health. Dentists up to within a few years looked upon teeth simply as part of the human machine, to be regulated, repaired, removed, or replaced, as the case might be, but with little or no regard to their relation to the rest of the human organism.

Within a few years a new conception of the importance of the teeth has arisen in the minds of both physicians and dentists, so that now some physicians, when they cannot find or before they have found the cause of certain systemic and organic disturbances, look upon the teeth as *the* cause and the dentist as *the* instrument in removing the cause of these diseases. Yet there are other physicians who do not consider teeth as having any material effect on the cause or course of systemic diseases.

There is still another class of physicians who look upon the teeth as one of the most important factors, direct and indirect, in the cause of certain systemic and organic diseases. They further believe that in consultation and co-operation with the dentist and the employment of the X-ray the local dental cause, if any, may be discovered and eliminated. These I believe to be taking a reasonable and just view of the situation.

Still other physicians and dentists are expressing the fear that the pendulum is swinging too far in the direction of indicting teeth as the cause of systemic disturbances. They say dentists and physicians are claiming that all diseases and all infections may be traced to the teeth. This seems to be a very extreme view of the matter. Most of us have no such fear. The only fear I have is that not enough attention will be given to the teeth; the fear that the importance of the teeth may be lost sight of, and that they may not be placed in such condition that they will help to fortify the body and build up the forces of resistance to disease.

A report on the pathogenicity of mouth streptococci in the May *Journal of the National Dental Association* states:

"We have noted several cases where mouth streptococci from dental abscesses have invaded the lymph glands of the neck, and produced a chronic non-suppurative lymphadenitis with cellulitis in one case, and two cases where strains of high virulence invaded the blood stream and produced death from septicemia; but aside from these non-specific types of infection, which may at times be produced by any organism, we do not believe that mouth streptococci have been proved to cause any other systemic disease than the various lesions that go to make up the disease known as rheumatism."

What is more important, it seems to me, than the failure to find these micro-organisms in other localities than those stated, is the larger fact that it is the diffusible indetectable toxins produced by these micro-organisms and other micro-organisms that cause greater, more insidious, and more widely distributed systemic and organic disturbances.

Let me call attention to that celebrated bacteriologist in London who had appendicitis and an infected tooth root at the same time. He refused to be operated upon until the infected root was removed. Then an examination disclosed the same micro-organism in the appendix that was on the tooth root. He also had colitis. A vaccine was made from the culture taken from the end of the tooth root and the appendix, and this cured his colitis. He also had nasal catarrh, and this was cured by the same treatment.

It seems to me that it should matter little to us whether or not the streptococcus viridans can be successfully isolated from or found in but one or two important organs, or in a dozen cases. We have the opinions of distinguished pathologists supported by abundant evidence, that when the streptococcus viridans is found in the blood, it is a "four-alarm fire signal, and all hands to the pumps." The why, how, or when they get into the blood from these apical abscesses is not so important right here as is the indisputable fact that they *do* get into the blood. And I should have said in parenthesis that the previously named organism is the one most constant in these chronic apical infections.

How many things are known to be true for which we can not furnish the proof. The known provable things are very few. It is possible for me to read the history of case after case, both from my own practice and that of others, indicating the direct and positive connection between apical infections and systemic disease. This is neither interesting nor necessary, but I cannot help mentioning one or two in brief.

From a list of a number of cases cited by Dr. Epstein in the *Medical Record*, October 21, 1916, I select two.

A patient fifty-five years of age had an infected osteo-arthritis of the ankles and tarsus. This case was cured not by medicine but by the extraction of several abscessed teeth. Another patient had a severe form of articular rheumatism, and this case was cured not by drugs but by the extraction of an abscessed cuspid.

Rheumatism is practically always a metastatic inflammation and an arthritis which tends to recur as nature's warning of her effort to eliminate pus from some source.

Potter of Columbia University, in the *New York Medical Journal* of February 10, 1917, gives a list of 31 different diseases to which dental sepsis contributes. Some of these systemic and organic diseases may be accounted for by means of Billings' explanation, viz, that a chronic alveolar infection and chronic foci in other regions of the body may cause systemic disease by hematogenous bacterial emboli, which infect and at the same time deprive the tissues of nourishment. Local infections of muscles, joint tissues, and lessened blood supply result in the peculiar morbid conditions of the respective tissues. In 95 per cent. of the cases of herpes zoster, Dr. Lain of Oklahoma City found apical abscesses. In 85 per cent. of the cases of lichen planus local infections were found. In a majority of the cases the symptoms began to subside within a short time after the extraction of the infected teeth, and yet, gentlemen, we are told that the pendulum is swinging so far that we should be conservative.

It appears to me that the responsibility which is being placed upon the dentist's shoulders, instead of being a burden to be side-stepped or shifted will rather be a magnet that will lift dentistry to a higher level in the esteem, confidence, and honor of the community.

It has been said that I am too enthusiastic about the possibilities of dental service and of the future of dentistry, but let me remind those who do not share in this enthusiasm that without enthusiasm nothing great was ever accomplished. No one applauds more heartily or more earnestly than I the high standard of human service rendered by the medical profession, more so now that the day has arrived when the dentist may, if he will, render a similar service, and share with the medical man a like honor and distinction. That he is ready and willing to assume this responsibility I am convinced from this wonderful gathering of men from four states, in their eagerness to seek and then to intelligently carry this responsibility.

8 West 40th st.

An Instrument to Facilitate the Adjustment of the Angle Ribbon Arch.

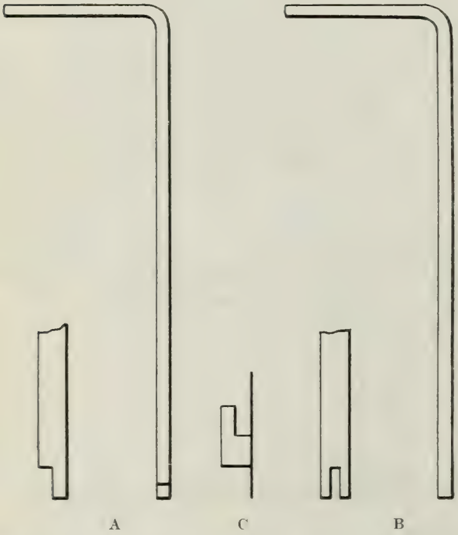
By ROBERT W. GASTON, D.D.S., New Orleans, La.

In using the Angle ribbon arch, I have found it somewhat difficult, when adjusting the arch in the brackets, to determine whether the alignment of the arch with the bracket was just as I wanted it to be—in other words, to determine how much root movement or rotation would be produced by a certain adjustment. This was because of the fact that, owing to the necessarily small size of the appliances, it is difficult to determine, with the unaided eye, just how much variation there is between the alignment of the arch and the bracket. For the amount of root movement beyond that of the crown will be determined by the degree of variation of vertical alignment between the arch as it is contained in the bracket, and the bracket itself; while the amount of rotation will be determined by the degree of variation of the horizontal alignment of that part of the arch that is contained within the bracket, and the bracket itself.

In order to determine more accurately the relation, both horizontal and vertical, of the arch and bracket, I have devised a set of instruments that have been of great assistance to me, and are at the same time uncomplicated.

The instruments consist simply of two pieces of wire, as shown in Fig. 1, A, with one end of each bent at right angles, and the other end of the female instrument containing a slot the exact size of the ribbon arch wire (see B, Fig. 1), while the other end of the male instrument contains a projection which accurately fits within the bracket of the regular bracket band, Fig. 1, C.

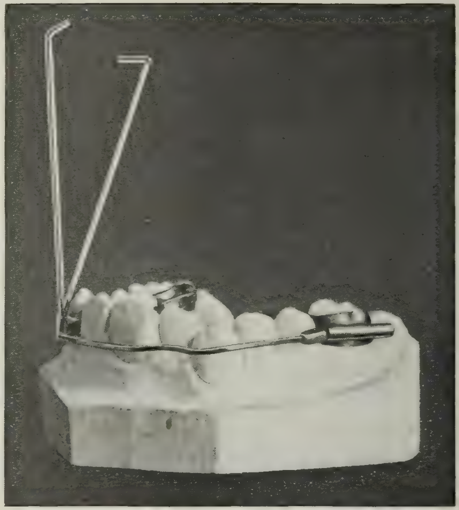
FIG. 1.



Showing—A, B. Male and female instruments, and cross section of ends, enlarged. C, Angle bracket of ribbon arch, enlarged.

In using the instruments, the regular bracket bands are first adjusted to the various teeth, and the ribbon arch placed in the mouth with the ends in the buccal tubes, and adjusted to the teeth as it is judged that it should be. Now, to determine whether you have the relation of the arch with the bracket as you wish it to be, the end of the male instrument is placed in the bracket on the tooth, as in Fig. 2, having the arch lying in close contact with it, but not in it; then the female instrument is placed on the arch at the exact point that is to be contained in the bracket, and both held gently so as to allow each instrument to assume the position it is inclined to do. The relationship of the handles of the two instruments will now indicate the exact relationship of the arch and bracket. In other words, if the handles of the instruments stand parallel with each other, as in Fig. 3, it will indicate that the arch and bracket are parallel vertically, and that there will be simply a bodily movement of the tooth; but if there is a variation in the alignment of the instruments it will indicate that there is that same degree of variation between the bracket and arch, and that there will be a corresponding root movement beyond that of the crown, to just the extent of the variation of alignment. (See Fig. 2.)

FIG. 2.

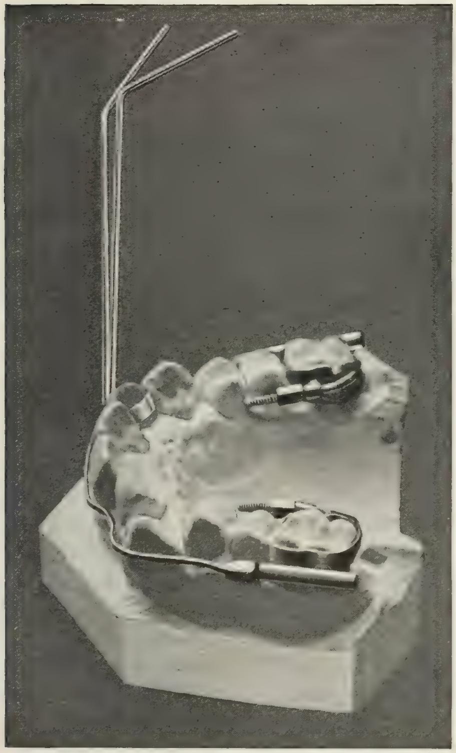


Instruments in position indicating that there will be root movement beyond that of the crown.

The amount of rotation that will be produced is shown by the right-angled portion of the instruments. (Fig. 3.)

After the instruments are in position, if the right-angled portions stand parallel it indicates there will be no rotation, but if those portions vary in alignment there will be a rotation of the tooth just in proportion to the degree of such variation. In this way it is possible to determine exactly just how much rotation will be produced with a certain adjustment when the arch has spent its force.

Fig. 3.



Instruments in position indicating that there will be produced a rotation of about 30 degrees, but no additional root movement—simply a bodily movement.

These instruments can be made by the orthodontist himself, but their value is dependent upon the accuracy with which they are made. The slot in the female instrument must be perfectly parallel with the long axis of the handle longitudinally, and the cross section of it parallel with the right-angled portion. If there is any inaccuracy in making the operative ends of the instruments they will not indicate the true relationship of bracket and arch.

This same principle may be used in connection with the pin-and-tube appliance. In this the instruments are more easily made, for the male instrument may be simply a straight piece of wire about two and one-half inches long and of the exact gage of the inside diameter of the small tubes, while the female instrument may be a piece of wire of the same size, with one of the small tubes soldered on the side of one end. Great care should be used in soldering this tube to the wire to see that it is perfectly parallel with the long axis of the wire, and that the latter is perfectly straight.

The handles of these need not be bent at a right angle, for they cannot determine the amount of rotation, using the pin-and-tube appliance, as is done with the ribbon arch and bracket bands, but can only indicate the direction of the root movement.

These instruments are used in the same manner as the bracket instruments, placing the male instrument in the tube on the tooth and the female instrument over the pin of the arch, and noting the relationship.

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Dental Abscess or Infection and Its Consequences.

By JUDSON DALAND, M.D., Philadelphia, Pa.,
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(Read by invitation before the Susquehanna Dental Association of Pennsylvania at Allentown, May 23, 1917.)

A FULL recognition of the principles concerned in focal infection as a cause of constitutional diseases constitutes an epoch-making advance in the etiological diagnosis, prevention, and cure of certain diseases, many of which affect vital organs. It has long been recognized that focal infection causes systemic diseases, but hitherto it has been considered a rare occurrence. Dr. W. D. Miller more than a generation ago pointed out the constitutional effects of oral sepsis. The present concepts of focal infection, however, follow an entirely new line of thought, and concern themselves with serious and sometimes irreparable damage to vital organs, secondary to a latent focus of infection, sometimes so small and apparently so insignificant that many believe it incapable of producing systemic diseases. It is important to remember that *the virulence of the organism is more important than the size of the lesion.* Focal infection may cause diseases of joints, tendons, bones, blood, cardio-vascular, nervous, gastro-intestinal, genito-urinary, pulmonary, and ductless gland systems.

ORGANISMS WHICH CAUSE FOCAL INFECTION.

Focal infection may be due to one or more of several organisms, but is generally due to streptococcus, occasionally to staphylococcus, and these two cocci may exist in the same focus. Occasionally the streptococcus or staphylococcus may be associated with pneumococcus, micrococcus catarrhalis, influenza bacillus, diphtheria or pseudo-diphtheria bacillus, gonococcus, tubercle bacillus, or saprophytic organisms. It is important to remember that in most instances the streptococcus viridans or hemolyticus is the infecting organism. This coccus is present in many mouths apparently normal, and may be acquired by carriers or by food or milk. The origin of all micro-organisms is unknown. From the standpoint of virulence, specificity, and trophism, streptococci may be arranged in the following order: (1) Streptococcus hemolyticus; (2) streptococcus rheumaticus; (3) streptococcus viridans; (4) streptococcus mucosis.

The conscientious, painstaking work of Rosenow has clearly proved that the streptococcus, by cultural methods or by passing through laboratory animals, may be transmuted into any one of these varieties or into the pneumococcus. He has also proved that these organisms possess specificity for certain tissues of the body, and that variations in the transmutability, pathogenicity, and specificity produced in the laboratory also take place in the human body.

SECONDARY FOCI OF INFECTION.

Secondary infections usually take place by way of the blood or lymphatics, and pathogenic micro-organisms have been observed in secondary foci as emboli. The septic focus produces not only micro-organisms but also toxins, which play an independent rôle in causing chemic trauma of various tissues of the body; and evidence exists tending to confirm the belief that these toxic substances also possess selectivity, or that certain tissues select these toxic bodies. Secondary infections from focal sepsis may be prevented by immunity or low virulence of the organism; natural immunity may be lost by mental or physical overwork, loss of sleep, lowered nutrition from insufficient food or defective digestion; prolonged exposure to cold; shocks from physical or mental trauma, or from intercurrent diseases, such as influenza, typhoid fever, or diabetes. An avirulent organism may become virulent from diminution in the supply of oxygen, as, for example, by blocking a sinus draining a septic focus.

The clinical proof that focal infection causes systemic diseases rests upon (*a*) observed association of cause and effect; (*b*) removal of focus followed by disappearance or amelioration of the disease; (*c*) removal of focus followed by disappearance of leucocytosis or lymphocytosis; (*d*) the exclusion of any other known cause of the disease.

THE TEETH AS THE MOST COMMON SEAT OF THE PRIMARY FOCUS OF INFECTION.

The location of the primary focus of infection may be anywhere, but occurs most frequently in the cavities of the head. After forty years of age the teeth or gums are the most frequent seat of the primary focus of infection. When the primary focus has been removed, a secondary focus, such as the lymph nodes, may become the primary focus, and cause or continue constitutional disease. The best example of a small focal infection is an abscess about the root of a tooth occupying an area no larger than a small split-pea. Periapical abscess or infection may be single or multiple, acute, subacute, chronic or latent, and may be modified by symbiosis, remain local, cause systemic disease, or coexist with septic foci in the tonsils or sinuses. Only occasionally is a periapical abscess secondary to a primary focus, at a distance from the root affected, or from other parts of the body; but extension from one root to another by contiguity is frequent. A secondary periapical abscess often affects the roots of otherwise normal teeth; whereas primary periapical infection or abscesses usually occur in teeth previously diseased or devitalized, or by the extension of pyorrheal pockets along the sides of the root.

Abscesses or infections about the roots of the teeth frequently exist for months or years before detection, and it is probable that systemic infection occurs intermittently, depending upon varying degrees of natural or acquired susceptibility or immunity, or varying degrees of virulence of the micro-organisms.

NECESSITY OF CO-OPERATION BETWEEN DENTIST AND PHYSICIAN IN DIAGNOSING FOCI OF INFECTION.

The diagnosis of acute focal infection at the root of a tooth when the gum is red, swollen, and painful, or an alveolar fistula is discharging pus is obvious. My experience is chiefly confined to latent periapical abscess causing systemic disease where no local signs or symptoms are present. As approximately fifty-four roots exist in the mouth of an adult, any one of which may be a focus of infection, it is not difficult to understand why a primary focus of infection may be overlooked, more especially in view of the fact that after the fortieth year of life the teeth and gums are more frequently the seat of focal sepsis than any other portion of the body. Whenever systemic manifestations of focal sepsis occur, and if the primary focus exists or probably exists in the mouth, the physician and dentist should meet in consultation in order to determine whether the teeth should be treated or extracted. Each should detail the results of his examination, so that the patient may receive the maximum benefit. Many dentists view the mouth cavity as dissociated from the body, and seem unable to comprehend the principles of focal infection and its serious and sometimes fatal results, and resolutely oppose the extraction of a tooth if it causes no pain to the patient, more especially if its absence interferes with mastication. In certain cases the danger to the health and life of the patient is so great that in the absence of any other known source of infection the tooth suspected of causing it should be extracted, even if it is impossible to convert the suspicion that the tooth is diseased into a certainty, for the reason that it is manifestly wiser to sacrifice a tooth than to sacrifice the patient.

CASES IN WHICH IMMEDIATE EXTRACTION OF TEETH IS NECESSARY.

Whenever a patient shows secondary involvement of a vital organ, the infected tooth should be immediately extracted. Extraction is preferable to treatment when serious systemic disease from periapical infection is strongly suspected, when skilled dentistry cannot be secured, or when the tooth is useless. The average dentist or physician is entirely satisfied that no dental infection exists in the absence of local signs or symptoms, and the consulting physician usually receives little encouragement from the patient or dentist in diagnosing latent periapical abscess, but on the contrary often encounters opposition. A roentgenogram may give sufficient evidence to justify the removal of artificial dentures and exploration of root-canals and periapical spaces in order to secure evidence upon which to base a diagnosis. The patient is usually opposed to spending time and money in order to convert a suspicion into a reality; the dentist is unwilling to remove costly artificial dentures which have been constructed with great mechanical skill, and rests firmly in the erroneous belief that if the patient complains of no symptoms, he should "let sleeping dogs lie." The physician is sometimes mentally lazy and indisposed to assume the responsibility for advising measures that are often painful, time-consuming, and costly, and which *may* lead to a negative diagnosis. The thoughtful physician and dentist are concerned because the removal of focal infection is sometimes only possible by extracting teeth whose removal may seriously interfere with mastication.

When the dental pulp has been destroyed by infection or by the dentist preparatory to filling or capping a tooth or making an abutment for a bridge, it is not surprising that a periapical abscess often causes no pain. A latent periapical abscess or infection may be suspected when a tooth is devitalized, loose, or the crown contains a large filling, or when the gum over the roots is thickened. An infected root may be suspected or diagnosed if painful, or if pain is induced by mastication, pressure, or percussion, or by observing the reaction of the tooth to heat, cold, or electricity. A roentgenogram should be made of the roots of all teeth, and not alone those suspected of being infective, and evidence thus obtained may not only aid in diagnosing abscess of the roots of suspected teeth, but may reveal unsuspected periapical abscess or infection. A skilled dentist, alive to the importance of focal infection, may open suspected root-canals and discover a putrescent or infected pulp, pus, or pathogenic organisms, even though the roentgenogram shows no evidence of disease.

POLYARTICULAR RHEUMATISM THE MOST COMMON SYSTEMIC MANIFESTATION OF FOCAL INFECTION.

The most common systemic manifestation of focal infection is that clinical syndrome known as acute polyarticular rheumatism, usually affecting the larger joints, but which may affect any joint, preferably one that has been previously injured or diseased. A patient with mild polyarthritis, dental in origin, was apparently cured by drainage of an infected root-canal. Eight months later an acute cholecystitis occurred, and when the infected tooth was extracted it showed a putrescent pulp, and a culture from the periapical space showed streptococcus viridans. Eight months later facial paralysis occurred suddenly. Examination revealed a small remnant of tonsil remaining after tonsillectomy, which had been performed more than ten years previously, removal of which showed the presence of pus. A few of the cervical glands were enlarged. Later the paralysis disappeared.

Amelioration or disappearance of the local signs of systemic infection without cure of the primary focus of infection occurs more frequently than is generally believed. A patient with acute polyarthritis was greatly relieved by the extraction of three teeth the roots of which were abscessed. Marked improvement continued for two months, followed by a relapse, and re-examination showed a periapical abscess which had been overlooked, the removal of which was followed by a slow recovery. This last winter I have observed three men with ulcerative endocarditis affecting previously diseased valves, due to dental sepsis, whose lives might have been saved if the diagnosis had been made early, the septic focus promptly removed, and autogenous vaccine employed. I have frequently corroborated the observation made by Hunter many years ago that mild, severe, or pernicious anemia may be caused by oral sepsis. I am convinced that dental focal infection *causes endarteritis* and also aggravates endarteritis due to other causes, more especially syphilis.

Pyorrhea may cause toxemia, malaise, muscular weakness, anemia, furunculosis; but arthritic, cardio-vascular or gall-bladder manifestations are less frequent, unless a deep pyorrheal pocket exists, so situated as to prevent the access of oxygen to the infective organism. When pyorrhea is associated with involvement of the alveolar process secondary manifestations are more common. Pyorrhea may cause infection of the tonsils, which in turn may cause systemic disease.

CONCLUSIONS.

(1) Focal infection, dental or oral in origin, may cause slight, serious, or fatal disease of almost any tissue or organ of the body, more commonly affecting joints, bones, muscles, blood, heart, vessels, kidneys, and nerves. Secondary infection may be aggravated by tonsillar disease when these glands are infected by mouth sepsis.

(2) Acute periapical infection or abscess is usually diagnosed. Chronic latent periapical infection or abscess usually escapes diagnosis, due to carelessness or ignorance on the part of physician, dentist, or patient.

(3) Many dentists hold the erroneous opinion that periapical infection or abscess produces no systemic disease in the absence of pain, and moreover decline to treat radically periapical abscess or infection because a latent infection may be converted into an acute infection, failing to recognize the greater danger from the continuance of a systemic disease if a latent septic focus is allowed to remain.

(4) The falsity of the prevalent belief in non-interference with latent dental septic foci, embodied in the injunction to "let sleeping dogs lie," should be deeply implanted in the mind of every practitioner of dentistry.

(5) When a dentist discovers dental septic foci or pyorrhea he should advise his patient to consult his physician.

(6) When a physician discovers serious disease of an important or vital organ, or tissue, such as the joints, muscles, heart, kidney, or nervous system, the dentist should co-operate to determine whether the cause lies within the buccal cavity, and in the absence of any other discoverable focus of infection should assume that a suspected focus in the mouth is the cause of systemic disease until the opposite is proved, recognizing that in doubtful cases it is wiser to occasionally sacrifice a tooth than to sacrifice health or life.

(7) When a physician consults with a dentist regarding the etiologic relationship of the mouth cavity to systemic disease, the dentist should give the physician the benefit of his expert advice, not solely from the mechanical, but from the mechanical and biological point of view, with proper consideration of the medical evidence in the case.

(8) Appreciation of the importance of removing oral sepsis which may be the cause of systemic disease necessitates that

additional instruction be given to students and practitioners of dentistry, and clearly demonstrates that the practice of dentistry shall no longer be ninety per cent. mechanical, but that a generous percentage of time be given to the consideration of the relationship of mouth sepsis to the systemic welfare of the patient.

(9) The evils following devitalization of teeth to secure improved mastication are but dimly appreciated, and systemic infection from recession and suppuration of the gums, pyorrheal pockets, capped teeth, and artificial dentures have received little or no consideration. Serious systemic disease has followed oral sepsis caused by artificial dentures designed to improve mastication.

(10) Despite earnest effort on the part of members of the medical and dental professions, the rank and file still remain apathetic to the vital importance of the prompt detection and removal of septic foci in the mouth; and in my opinion the future will demonstrate that the importance of a septic mouth as a cause of ill-health or serious or fatal disease is far greater than is now believed.

(11) The etiology, diagnosis, and treatment of septic foci in the mouth is essentially a problem belonging to the dental profession; it must be courageously attacked and solved, and the added service to mankind will make dentistry one of the most important specialties in medicine.

(12) An urgent need exists for additional early signs of periapical infection and systemic invasion. Lymphocytosis in the absence of leucocytosis is occasionally a sign of systemic invasion from a latent focus of infection.

(13) The American dentist is recognized as the foremost in the world, largely through originality, invention, industry, ingenious mechanical devices, and dexterity. The same energy and intelligence directed toward diagnosis, prevention, and cure of oral sepsis will yield similar brilliant results.

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[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

The Relation of the Hospital to the Community.

By HENRY I. KLOPP, M.D., Allentown, Pa.,
SUPERINTENDENT HOMEOPATHIC STATE HOSPITAL.

(Read before the Susquehanna Dental Association, Allentown, Pa., May 23, 1917.)

THE watchword today is *Efficiency*, and may be defined as—"Production which secures a full output in the shortest time with the least effort, and which reduces waste to a minimum." In America, efficiency has attained its ideal almost exclusively in industry, where it has reached a high degree of perfection. Employers of labor are finding it more and more advantageous to see to it that those who work for them are well, prosperous, and happy, and, of course, temperate. There can be no national efficiency until it is realized how many people there are who grasp for what they can never hope to attain, who try for what they are certain to fail at, and who would have been far better off had they at the outset correlated their aims with their capacities, both physical and mental. In foreign countries which have a military *régime,* only a little over fifty per cent. of men are fit for first-class service. About thirty per cent. of applicants are received in our Naval Academy, and only one applicant out of thirty-five for the Marine Corps is enlisted. One of the first points to be made clear to the minds of the public is that physical disease offers fewer obstacles to a national efficiency than do defects or disorders of mentality.

The needs of the community from the hospital standpoint are essentially three—first, education as to the causes, treatment, and prevention of disease; second, instruction as to the after-care of patients who return to community life; third, an awakened sense of responsibility toward dependent or partially dependent persons who are mentally handicapped.

A state hospital, in order to perform its work in the most efficient manner, must have the confidence of the community it serves; this is especially applicable to the care and treatment of the mentally sick. Any hospital that admits a patient really enters into a contract with that individual to give its assistance by doing everything possible to the end that the patient may be restored to health.

All large manufacturing establishments today look carefully after the health of their employees. Various states have placed laws upon the statute-books requiring the employer to carry accident insurance for his employees, and at present we have agitation for the addition of health insurance.

The medical and dental professions may take a proper pride in being the pioneers in the movement for prevention of disease, especially when it is obvious that such effort has a tendency to diminish the material rewards of the profession, and eventually to eliminate the "physician," as we understand that title, altogether. We shall have to adopt the Chinese method, namely, the physician receiving pay during the time the individual is in good health, compensation being discontinued when sick.

Our state hospitals until the past ten or fifteen years were merely custodial institutions, but today those which are of a progressive type serve as educational centers, reaching out into the community and rendering assistance wherever possible. We repeatedly make the statement that the "problem of mental disease is a large and far-reaching one." The reason for this is that no class of people in the community cost more in dollars and cents than these unfortunates. I am convinced that more can be done by bringing the hospital in closer touch with the community, thereby reaching those who most need our assistance and advice. This can be done by the establishment of out-patient departments in connection with our state hospitals; and especially by holding clinics at stated intervals, once or twice a month, in centers of population within our hospital districts. In this way we are more likely to reach the individual who may hesitate to come to the hospital for examination and advice; physicians will bring patients for consultation; charitable agencies, principals, and teachers of schools may be given suggestions.

Thus the individual on the borderline of mental unbalance will be more likely to apply for examination and treatment. At out-patient clinics, patients who are absent on visit can report regularly; those who have been discharged and desire information will be more likely to appear there for advice than to call at the hospital. This is a step forward in the after-care of patients, especially in the absence of a field or social worker. Breadwinners and mothers who are worried and concerned either about themselves or members of their households, will become patients at these clinics as a part of the out-patient department, and recipients of supervisory care. In this way we should be able to advise preventive measures; if in needy circumstances, we might, by referring them to proper agencies, prevent unnecessary sickness, poverty, suffering, and possibly obviate an actual attack of mental disease. From my experience with patients who call at the hospital for examination and advice, particularly those referred to us by secretaries of charitable associations from our three neighboring cities, I am convinced that much good can be accomplished and more cases will be brought to our attention by the establishment of clinics; furthermore, the character of such cases is different from those regularly committed to our hospitals. Such a clinic has been in operation for almost two years, with profitable results, in the city of Easton, in connection with the Charity Organization Society. The medical officers of the hospital have charge of it, going there the last Monday of each month. A great deal has been accomplished with defective and backward children as a result of examination and advice. A similar clinic has been established in the city of Allentown in connection with the Associated Charities, this clinic being held on the first Wednesday of each month.

Sooner or later we should establish a "social service" department, employing the services of a field and social service worker to do follow-up work. Our duty, to my mind, does not end with the mere furlough or discharge of patients. A combination field and social worker would be an important factor in obtaining more complete family and personal histories, to follow the progress of patients in their homes after leaving the hospital, to study their environment, and advise such changes in occupation and recreation as may be considered best for their welfare. This social worker—who might possibly be a physician—should also instruct the family, and bring about the patient's prompt return to the hospital if not doing well. Such a worker can accomplish as much good for the mentally sick as is being done in connection with civic hospitals in our large cities.

Every effort should be made to bring the hospital into closer touch with the community, thereby securing the co-operation and interest of the citizens in its welfare, and above all, for their own benefit. This can best be accomplished through the co-operation of the family physician.

The out-patient and social work should amount to something more than attending to the needs of the individuals and families immediately concerned, namely, the carrying on of a campaign of education in the community; the removing of distrust, teaching the community that the hospital influence it seeks is kindly, helpful, and co-operative—it is teaching the hospital to better understand the community view, and to cope more intelligently with the problem of securing for its patients as early a return to the home as possible. In discharging patients into the community where there is a lack of information as to home conditions, the report of the social worker is of great value in determining proper action. If patients have no home or friends, employment may be secured, proper boarding-places found, and assistance given in placing them once more in a position to become self-supporting.

Finally, the hospital should first cooperate with the physician, and through his influence and assistance with those who need its service. In this way the relation of the hospital to the community will mean prosperity, preparedness, and above all, prevention of disease.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

Radiology as an Adjunct in the Practice of Dentistry:

BEING THE

Report of the Correspondent, Dental Society of the State of New York.

By L. M. WAUGH, D.D.S., New York, N. Y.

(Read before the Dental Society of the State of New York, at its annual meeting, at Rochester, May 11, 1917.)

YOUR Correspondent, with the approval of some of the officers of the society, selected "Radiology as an Adjunct in the Practice of Dentistry" as the topic for the report of this year. This decision was reached because of the conviction that the great majority of the profession are, as yet, employing radiographs but sparingly, and that only a comparative few are installing equipments and availing themselves of the aid and giving their patients the benefit to be derived from the *unrestricted* use of radiographs as a guide in daily practice. For the purpose of obtaining a representative expression of opinion from dentists who have been doing their own radiodontia, six of the largest manufacturers of apparatus specially designed for this work were asked for a partial list of those who had purchased outfits from them. All responded, the lists including practitioners in nearly all parts of the United States and three provinces of Canada. Two hundred and twenty-five names were selected from these lists, and in addition the names of one hundred leading practitioners, regardless of their attitude toward radiology, were added. This embraced three hundred and twenty-five dentists, to each of whom the following circular letter and list of questions were sent:

My dear Doctor,—You have been selected by the Correspondent of the Dental Society of the State of New York as one from whom it is desirable to obtain an expression of opinion for the report of this year.

The response to the list of questions sent for the previous two reports was most gratifying. Last year, answers were received from 153 dentists, practicing in twenty-four states and in four provinces of Canada, and included answers from teachers in forty-four dental schools and sixty-five from practitioners not associated with dental faculties.

Some of the officers approved the topic "Radiology as an Adjunct in the Practice of Dentistry," therefore the following list of questions is sent you. Your answers, tabulated with those of others, will greatly aid the Correspondent in his effort to convince the great number of our profession who do not as yet realize it that *the unrestricted use of radiographs* is essential to honest dentistry.

Rest assured of the appreciation of the society and of the personal gratitude of the Correspondent.

Sincerely yours,

L. M. WAUGH, *Correspondent.*

QUESTIONS.

(1) *A.* Do you consider radiographs as being essential to best practice—taking dentistry as a whole?

B. Do you find that quite a number of a single case are often necessary, both for diagnosis and as a guide during the progress of treatment?

C. In the light of your present knowledge of their value, would you feel that you could be honest to yourself or your patient, without the use of radiographs?

(2) Do you regard in the technique of making radiographs that—

A. It is so simple that any practitioner may easily master it?

B. It may be done in practically any dental operating room without disarrangement of ordinary standard equipment?

C. The time required is so short as not to interfere materially with regular operative procedures?

D. All parts of the work, except placing the tube and film, can be done equally well by any average assistant?

E. A special knowledge of photographic procedures is unnecessary?

F. The health of neither operator nor patient is endangered by the use of modern apparatus?

(3) Have you reached the conclusion that—

A. The dental practitioner can make radiographs that best meet his needs, because of his intimate knowledge of individual conditions and of the requirements of the case in hand?

B. Because of this knowledge he knows from what angle the exposure can best be made?

C. A knowledge of the clinical history is essential to the intelligent interpretation of a radiograph?

D. The principles of interpretation, as understood up to the present, are not difficult of comprehension?

(4) In pulp cavity treatment—

A. Do you consider it necessary to radiograph every case?

B. Do you sometimes find conditions of a physical nature—as malformed or excessively tortuous roots, etc.—that make treatment inadvisable?

C. What is the minimum number of radiographs that should be made of each case?

D. At what stages of treatment should these be made?

E. What is the maximum number you have made of a single case?

F. Do you consider it necessary to make radiographs in doubtful cases at intervals after the canals appear to have been well filled?

G. What is the average interval between radiographs made for this post-operative observation?

(5) *A.* Do you make a separate charge for each radiograph?

B. If so, does the patient not sometimes question the need for several of a given case?

C. If not in your own practice, do you believe that this would be so in the great majority of practices?

D. Would this not be overcome by having it understood that the necessary radiographs are a part of the service, and as such are not charged for separately, but are included in the general fee?

E. Do you find that the time saved by radiodontic findings largely compensates for the time required in making them?

Answers to the questions were received from 192 dentists, practicing in twenty-seven states and in three provinces of Canada.

The answers were carefully tabulated and constitute the summary from which the conclusions in this report were drawn. The answers from those who have installed apparatus and have been making their own radiographs are so invariably in the affirmative that to quote from the numerous comments would seem superfluous and serve only to unnecessarily lengthen the report. It is notable that of those who have installed and use radiodontic equipment, *there is not one dentist who expressed disappointment or mentioned a preference for again having the work done outside his office.*

SUMMARY OF ANSWERS, WITH CONCLUSIONS.

Question 1.

(*A.*) *Do you consider radiographs as being essential to best practice—taking dentistry as a whole?*

"Yes," answered by 189. Answer evaded by 3.

(*B.*) *Do you find that quite a number of a single case are often necessary, both for diagnosis and as a guide during the progress of treatment?*

"Yes," answered by 176. "Once in a while," answered by 4. "No," answered by 7. Answer evaded by 5.

(*C.*) *In the light of your present knowledge of their value, would you feel that you could be honest to yourself or your patient without the use of radiographs?*

"No; could not be honest," answered by 181. "Yes," answered by 4. Answer evaded by 7.

Conclusion: In the light of present knowledge, the *unrestricted* use of radiographs is essential to honest dentistry.

Question 2.

Do you regard in the technique of making radiographs that—

(A.) It is so simple that any practitioner may easily master it?

"Yes," answered by 157. "No," answered by 25. Answer evaded by 10.

(B.) It may be done in practically any dental operating room without disarrangement of ordinary standard equipment?

"Yes," answered by 165. "No," answered by 18. "Possibly," answered by 1. Answer evaded by 8.

(C.) The time required is so short as not to interfere materially with regular operative procedure?

"Yes," answered by 159. "No," answered by 21. Answer evaded by 12.

(D.) All parts of the work, except placing the tube and film, can be done equally well by any average assistant?

"Yes," answered by 164. "No," answered by 19. Answer evaded by 9.

(E.) A special knowledge of photographic procedures is unnecessary?

"Yes, unnecessary," answered by 116. "No—is necessary," answered by 64. Answer evaded by 12.

(F.) The health of neither operator nor patient is endangered by the use of modern apparatus?

"Yes—health not endangered," answered by 174. "Doubtful," answered by 1. Answer evaded by 17.

Conclusion: That efficient and safe radiodontic equipment is now so compact and the technique so simplified that any dentist may, with but little special preparation, make satisfactory radiographic exposures in the dental chair regularly used in his operating room.

Question 3.

Have you reached the conclusion that—

(A.) The dental practitioner can make radiographs that best meet his needs, because of his intimate knowledge of individual conditions and of the requirements of the case in hand?

"Yes," answered by 169. "Possibly," answered by 6. "No," answered by 9. Answer evaded by 8.

(B.) Because of this knowledge, he knows from what angle the exposure can best be made?

"Yes," answered by 171. "Possibly," answered by 3. "No," answered by 3. Answer evaded by 16.

(C.) A knowledge of the clinical history is essential to the intelligent interpretation of a radiograph?

"Yes," answered by 177. "Undoubtedly," answered by 1. "No," answered by 4. Answer evaded by 10.

(D.) The PRINCIPLES *of interpretation, as understood up to the present, are not difficult of comprehension?*

"No, not difficult," answered by 110. "Yes, difficult," answered by 62. "Usually," answered by 1. Answer evaded by 19.

Conclusions: (*a*) That radiographs best meeting the needs of a given case can be made by the dentist treating that case, because of his intimate knowledge of conditions and requirements. (*b*) That the *principles* of interpretation are not difficult to understand, and that correct decision in a majority of cases depends largely on an intimate knowledge of the clinical history, which can best be known to the dentist treating the case; therefore he is in possession of the knowledge essential to the most intelligent diagnosis.

Question 4.

In pulp cavity treatment—

(A.) Do you consider it necessary to radiograph every case?

"Yes," answered by 99. "Some exceptions," answered by 7. "No," answered by 67. Answer evaded by 19.

(B.) Do you sometimes find conditions of a physical nature, as malformed or excessively tortuous roots, etc., that make treatment inadvisable?

"Yes," answered by 162. "Rarely," answered by 5. "No," answered by 6. Answer evaded by 19.

(C.) What is the minimum number of radiographs that should be made of each case?

"Three," answered by 53. "Two," answered by 70. "Four," answered by 4. "One," answered by 19. "Depends on condition," answered by 17. "Several," answered by 1. Answer evaded by 28.

(D.) At what stages of treatment should these be made?

"Before, during, and after treatment," answered by 76. "Start and finish," answered by 50. "When root-filling is complete," answered by 11. "Beginning," answered by 7. "Whenever there is a doubt," answered by 7. Answer evaded by 41.

(E.) What is the maximum number you have made of a single case?

"Forty," answered by 1. "Thirty," answered by 2. "Fifteen to twenty," answered by 2. "Twelve," answered by 5. "Ten," answered by 14. "Eight," answered by 11. "Seven," answered by 15. "Six," answered by 32. "Five," answered by 24. "Four," answered by 22. "Three," answered by 8. "Two," answered by 2. Answer evaded by 55.

(F.) Do you consider it necessary to make radiographs in doubtful cases at intervals, after the canals appear to have been well filled?

"Yes," answered by 139. "Sometimes," answered by 21. "No," answered by 15. Answer evaded by 24.

(G.) What is the average interval between radiographs made for this post-operative observation?

"One to two days," answered by 1. "Two weeks," answered by 2. "One month," answered by 16. "Two months," answered by 17. "Three months," answered by 30. "Four months," answered by 5. "Six months," answered by 47. "One in four months and another in a year," answered by 5. "Nine months," answered by 4. "One year," answered by 4. "Depends on condition," answered by 8. Answer evaded by 55.

Conclusions: (*a*) That in pulp cavity treatment a minimum of three radiographs should be made. The first, before beginning treatment, as means of diagnosis; the second, showing wires placed fully to the end of each root; the third, showing the filling material properly placed. Many intervening radiographs are often necessary. (*b*) That radiographs made at intervals of from two weeks to several months are frequently necessary for post-operative observation of doubtful cases. As the years pass they should also be made whenever local or systemic symptoms arise.

Question 5.

(A.) Do you make a separate charge for each radiograph?

"No," answered by 62. "Yes," answered by 87. "Sometimes," answered by 17. "Depends," answered by 6. Answer evaded by 20.

(B.) If so, does the patient not sometimes question the need for several of a given case?

"Yes," answered by 74. "Not often," answered by 15. "No," answered by 34. Answer evaded by 69.

(C.) If not in your own practice, do you believe that this would be so in the great majority of practices?

"Yes," answered by 116. "Possibly," answered by 10. "No," answered by 28. Answer evaded by 38.

(*D.*) *Would this not be overcome by having it understood that the necessary radiographs are a part of the service, and as such are not charged for separately, but are included in the general fee?*

"Yes," answered by 147. "Perhaps," answered by 8. "No," answered by 8. Answer evaded by 29.

(*E.*) *Do you find that the time saved by radiodontic findings largely compensates for the time required in making them?*

"Yes," answered by 162. "Occasionally," answered by 2. "No," answered by 8. Answer evaded by 20.

Conclusions: That it is consistent with professional dignity and conducive to greater efficiency to include the necessary radiographs as a part of dental service.

SUMMARY OF CONCLUSIONS.

(1) In the light of present knowledge, the *unrestricted* use of radiographs is essential to honest dentistry.

(2) That efficient and safe radiodontic equipment is now so compact and the technique so simplified that any dentist may, with but little special preparation, make satisfactory radiographic exposures in the dental chair regularly used in his operating room.

(3) (*a*) That radiographs best meeting the needs of a given case can be made by the dentist treating that case, because of his intimate knowledge of conditions and requirements. (*b*) That the *principles* of interpretation are not difficult to understand, and that correct decision in a majority of cases depends largely on an intimate knowledge of the clinical history, which can best be known to the dentist treating the case; therefore he is in possession of the knowledge essential to the most intelligent diagnosis.

(4) (*a*) That in pulp cavity treatment a minimum of three radiographs should be made. The first, before beginning treatment, as means of diagnosis; the second, showing wires placed fully to the end of each root; the third, showing the filling material properly placed. Many intervening radiographs are often necessary. (*b*) That radiographs made at intervals of from two weeks to several months are frequently necessary for post-operative observation of doubtful cases. As the years pass they should also be made whenever local or systemic symptoms arise.

(5) That it is consistent with professional dignity and conducive to greater efficiency to include the necessary radiographs as a part of dental service.

Your Correspondent desires, in the name of the society, to express gratitude to all those who so kindly contributed to this report. It is earnestly hoped that it will be the means of inducing very many more dentists to do their own radiodontia.

Respectfully submitted,

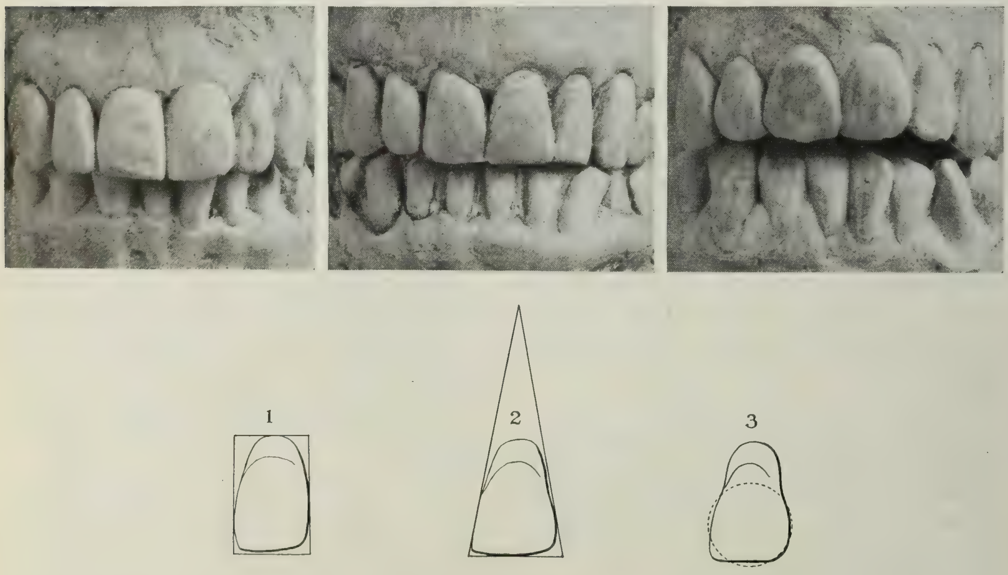
L. M. WAUGH, *Correspondent.*

Type *vs.* Temperament: The Harmonious Discord.

By NORMAN S. ESSIG, D.D.S., Philadelphia, Pa.

IN his previous article on Type *vs.* Temperament the author has endeavored to bring together or assemble certain facts which are most pertinent to the subject, and which will be of the greatest assistance to the student of human teeth and their comparative anatomy.

FIG. 1.



In analyzing the organs of mastication, and the true types to which they belong, it will be helpful to compare this process to the analysis of an unknown substance where it is desirable to determine the component parts of the compound; we may therefore regard the basal types as elements in the investigation, and assume that, like chemical elements, they cannot be resolved into their component parts; whereas teeth which have partaken of the characteristics of two or more of the true types may be classified as compounds for analysis.

It is necessary at this point to begin the treatment of the subject with a firm foundation under it, because through the process of investigation there will be constant reversion and reference to the fundamental basal types which are scientifically established.

It is our purpose to call attention to the fact that all variations from the true type are a composite of at least two fundamental types, and it is indispensable that the typical forms should be recognized and defined, so as to classify not only the blending or nondescript teeth but the basal types themselves.

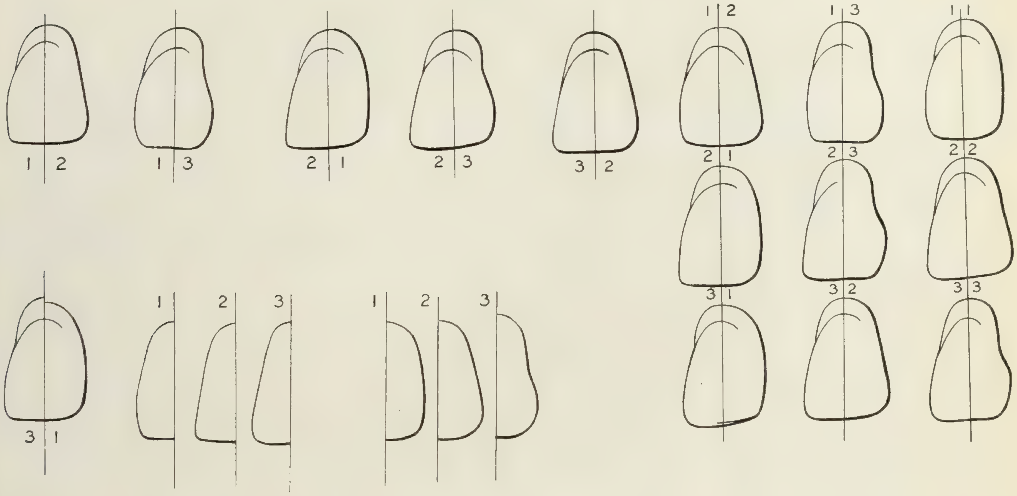
The three types to which we are able

to trace each variation are determined by the fact that they conform to the parallelogram, the triangle or pyramid, and the rhombus or circle. The diagrams and photos in Fig. 1 will show clearly these conformities to their fullest extent, and the order in which they occur.

No. 1 has the mesial and distal approximal surfaces approximately parallel.

No. 2 has its approximal surfaces converging at the neck and diverging at the cutting edge.

Fig. 2.



No. 3 is composed of a number of curves conforming to a great extent to the circle, and is, generally speaking, rhomboid in character. Hence, being able to definitely determine upon the basic types themselves, it is possible to divide a tooth in halves through its long axis and examine each half separately without reference to the other half, as shown in Fig. 2.

It will be easily seen that the greatest variation in the true types occurs in the distal half, the mesial half showing much less variation.

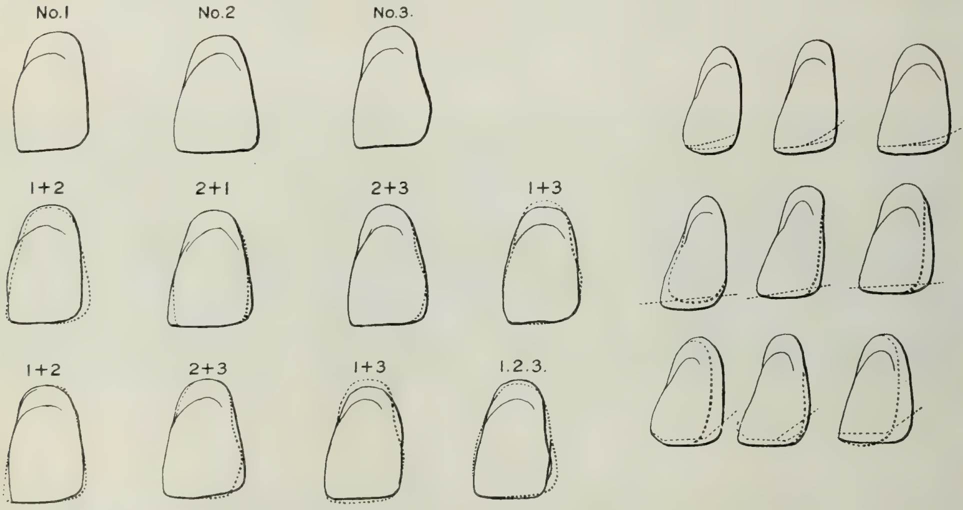
By the use of a templet accurately conforming to the lines of each type, we are able by tracing one over the other to see clearly their varying curves and half curves and the points at which their greatest difference occurs. This device should be of immense value to the prosthetist, as it opens the way to the special modifications of the true types, enabling him to adapt them to special cases. (Fig. 3.)

The anatomical and scientific aspects of this study have been gone over more or less thoroughly in the past, but nothing has been done to show the influence of one type on the other as far as the dentist is concerned, to enable him to modify artificial teeth systematically by grinding. This can be accomplished by a mere touch of the wheel if the prosthetist knows just where certain differences occur. This is an infinitely better method than searching for crossings from an immense stock at the dealer's, especially if the case in hand happens to be a partial one.

Select for each of the respective types the strongest and most characteristic forms, regard them as has been suggested, and by means of the templet it will be found that No. 1 varies from No. 2 principally on the distal or disto-approximal surfaces—therefore a slight touch with the wheel at that point will either produce No. 2 or a modification of it, as the operator desires; again, take either No. 1 or 2 types and modify by grinding, and No. 3 can be approximated at will; so also may No. 3 be modified so as to change it to either of the other types, or with slight effort the composite may be produced. Here the creation of harmonious discord may be begun by breaking up the regularity of form and size before the teeth are set up at all; for it must be remembered that no matter how little is done in that direction an improved appearance is obtained when the anteriors are assembled.

If the halves are placed together using the mesial half of any one with the distal half of the others, some of the crossings which are so common are produced. (Fig. 2.) These are not modified, up to this point, by wear, or the variations of profile and facial contour of the tooth in question, and for the present it will not be necessary to go deeply into that aspect, our object being to refrain from complications as much as possible until we are ready to take up the subject and view it along these lines, nor is it advisable to consider any but the comparatively normal tooth of the young adult, until the influence of one true type on the other is disposed of.

Fig. 3.



We must remember at this juncture that senility and wear for the most part keep pace. Older patients require a more modified tooth, because in such cases the modifications or crossings come into use more often than the more perfect teeth of the true types. It will be conceded by those who have made the subject a study that the normal tooth of the young adult is truer to type than are the teeth of persons beyond middle life; therefore, in the selection of a type which will harmonize with facial contour, our older patients require a very different handling. Too little attention and importance is given to approximal wear; many of the so-called crossings or modifications of the true type are the result of occlusal and approximal wear, which will probably account for the fact that while children often have what seem to be inappropriate dentures entirely unsuited to their mouths, these teeth become more harmonious as time goes on and the approximal surfaces come into closer contact. As they grow older, approximal wear keeps pace in its own proportion with the wear caused by modification, thereby modifying the original tooth by obliterating some of its curves, producing what may be termed an automatic temperamental rearrangement—though it must not be interpreted by this that the author is an adherent of the temperamental theory as such; but of this we may be certain, that whether we select teeth from a typal or a temperamental standpoint, the three great types are the foundation of both.

In the opinion of the writer, harmony of lines expressed in the judicious selection of teeth cannot be adequately accomplished by the contemplation of a single tooth.

Judicious arrangement can produce a fair approximation to temperamental harmony no matter what type of tooth is used. The anatomy of human crania is comparatively the same as far as the bony structure is concerned, yet some faces denote a nervous temperament, while others are sanguine; some physiognomies denote pugnacity, while a decidedly phlegmatic disposition may be portrayed in the next face we meet.

Teeth, regarded singly, are not symmetrical, whereas the face of the average human being for all practical purposes is symmetrical unless there is deformity. Therefore, to maintain harmony, teeth should be selected in pairs, the centrals being the guide, to obtain a bilateral symmetry. (Fig. 4.)

Lateral teeth, while often maintaining the same characteristic type as the centrals, are very prone to be arbitrary, and many times bear little or no resemblance to the type represented by the central incisors. (Fig. 5.) Moreover, it is possible and many times advantageous in order to modify results, to interchange the types of lateral with any type of central without disturbing the particular harmonious effect attained by the selection of appropriate central incisors. (Fig. 6.)

Fig. 4.

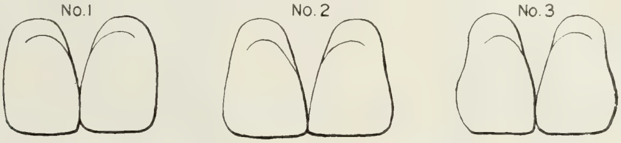
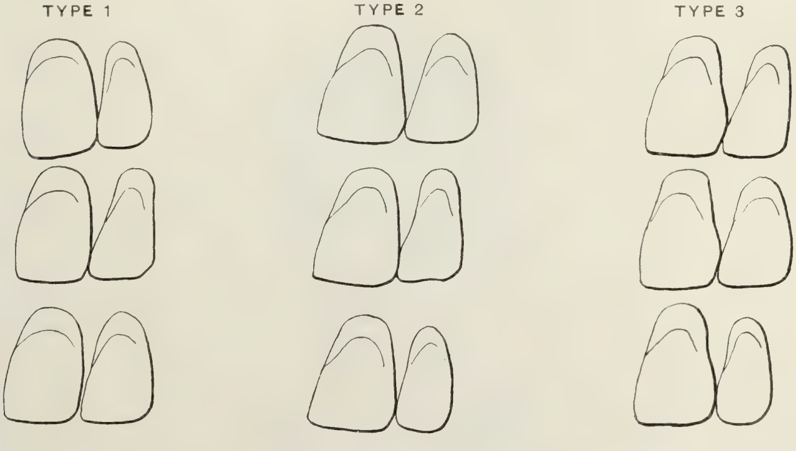


Fig. 5.

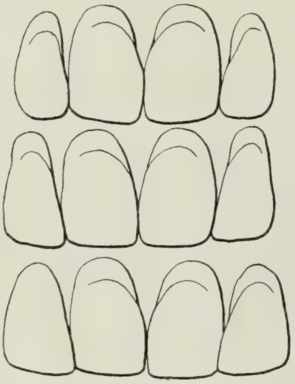


In other words, it is appropriate alignment rather than individual form of the laterals that either carries out or mars appropriate artistic arrangement of the centrals. Lateral incisors for the most part occupy only the space allotted to them by the centrals and canines during the period of development before eruption. This, of course, is greatly influenced by the bony structure or surrounding integument in which the capsule has its growth and subsequent development, and as the entire denture does not erupt simultaneously it is reasonable to suppose that the great variation is in part due to an arbitrary space allotted them by the adjoining teeth, both of which are of a stronger and more robust character.

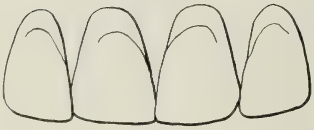
The adjustment of porcelain teeth in conformity to the lines of a given face should be accomplished by an artistic and harmonious draping of these substitutes, to which end the six anterior teeth must be viewed as a unit if we hope to appropriately express facial harmony or so-called temperament. This is especially true of the upper teeth, as the lower teeth have not the same amount of character when taken individually, but they carry out the harmonious effect more by sustaining what is designated by the uppers than by adding to the general effect thus attained.

Fig. 6.

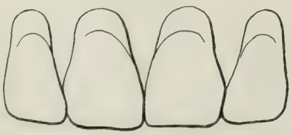
TYPE 1



TYPE 2



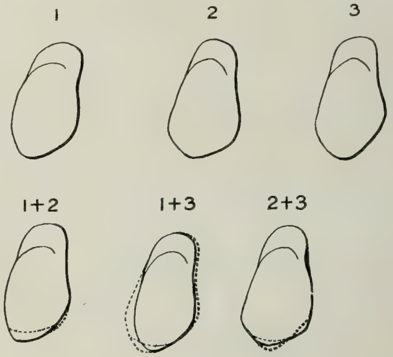
TYPE 3



In other words, centrals of a suitable form must be selected with a variation of laterals to harmonize. The canines at this point are of the utmost importance from the standpoint of temperament—which term we shall use to express or describe the characteristic effect produced by the use of any of the types or their modifications. Therefore, the lines of conformity must be created by judicious placement of the six anterior teeth on the arch, rather than by the selection of a single central tooth which but vaguely partakes of the characteristic lines of the face.

The writer believes that the portion of the face from which true harmonious lines should be taken is from the arch of the eyebrow to a line drawn across the face through and parallel with the commissure of the mouth, which will represent the line of the cutting edge, the eyebrows suggesting the necks of the teeth—the center of the nose being the median line, as represented in the accompanying illustrations. (Fig. 8, A, B, C.)

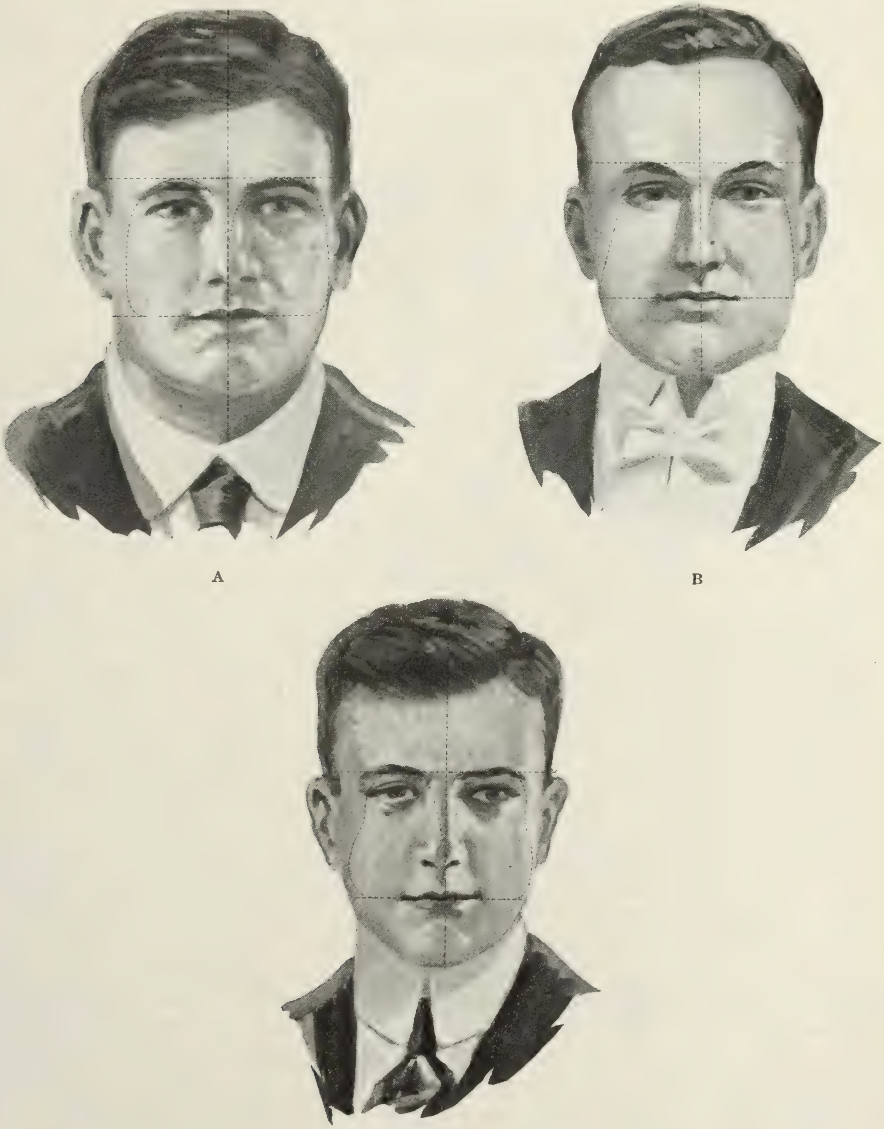
Fig. 7.



This has been to the author a simple and satisfactory method of selection, as the entire face to the average man has a confusing number of curves and shadows. Almost any face can be entirely distorted by the intentional rearrangement of light and shadow. Selection is made, therefore, of that portion of the face which gives the maximum of character and the minimum chance for misinterpretation.

Artificial canines are usually poor substitutes for the natural ones unless modified by grinding, and their judicious placement on the ridge is sadly neglected from the artistic standpoint. (Fig. 7.)

Fig. 8.



A

B

C

The arrangement of the canines will give greater character to facial expression, or the reverse, according to the intelligence employed by the prosthetist, and in consequence varied temperamental characteristic expressions may be obtained by their suitable arrangement, and in this way we are able to designate a high order of animal vitality which accompanies certain types of countenance having high cheek-bones; and again, a low order of intelligence; or, still further modified, produce the more sensitive expression often present as the result of civilization and refinement. These latter faces are prone to be more intellectual, but for the most part show less physical vitality.

1700 Locust st.

Mathematics of the Normal Dental Arch.

By ALEXANDER SVED, B.S.inC.E., New York, N. Y.,
SENIOR STUDENT IN THE NEW YORK COLLEGE OF DENTISTRY.

THE problem of determining the normal dental arch for a case which may be presented for orthodontic treatment, or the proper arrangement of the teeth in full upper and lower dentures has occupied the minds of many of our able investigators, who have devoted much time to obtaining a solution of this important problem. The results obtained by these men were so discouragingly divergent that it seemed almost impossible to lay down any general rules which would satisfactorily apply to all human arches. In our text-books and in dental magazines we find articles which show that although this problem has been taken up seriously by the profession, it has not been taken up properly, and that the investigators have been satisfied with but meager results which were obtained in an unscientific manner. Among the many results of their investigations we find that the teeth in the normal arch were held to be arranged on the arc of a circle or on parts of an ellipse, parabola or hyperbola, and all conclusions were drawn from the fact that it is possible to make a large number of arches fit a part of a particular curve. If conclusions can be drawn from such facts, there is no reason why a sine curve or a cosine curve, or any other suitable curve, cannot be proved to be the curve of the normal arch.

This, however, is not the main objection which may be raised against the results of the early investigators, for a definite curve may fit the arch approximately, and if a definite relation can be established between that curve and the arch, that curve can be used to determine approximately the relative position of the teeth, which would be close enough for practical purposes. In many instances, however, no attempt has been made to establish such a relation between the assumed curve and the arch, and if in the absence of such relation a normal arch cannot be constructed it is useless to make statements as to the character of the arch.

An attempt has been made by Hawley to devise a method by which the normal arch can be constructed for a given case, from the measured mesio-distal diameters of the teeth, by the aid of the ruler and compass. While his method has found a place in our modern text-books, it does not seem to have a definite foundation.

The most valuable information on this subject was furnished by Dr. Percy N. Williams of New York, in a recent article in the DENTAL COSMOS.* He has conclusively shown that there is very little or no difference between the arches of the different racial types and that there is a definite relation existing between the positions of certain teeth in the arch. Although Dr. Williams did not carry his measurements and conclusions far enough, his work is of inestimable value.

In this article I shall endeavor to lay down the theory of the "normal dental arch" on a firm scientific basis, and to devise a method of constructing an arch which will be within the easy reach of every practitioner.

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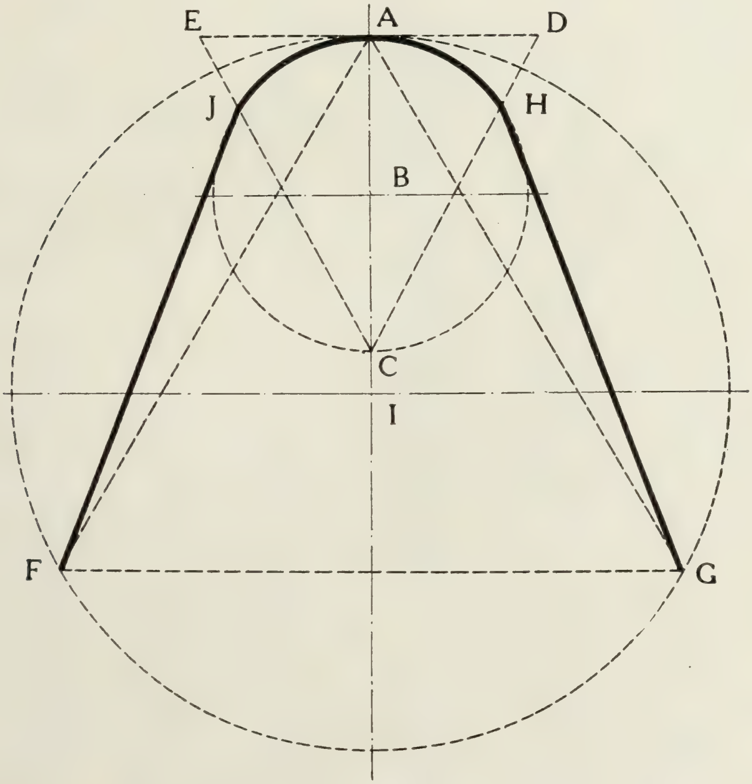
* "Determining the Shape of the Dental Arch," by Percy N. Williams, DENTAL COSMOS, July 1917, p. 695.

In what follows I have made free use of Dr. Williams' measurements, and all credit is due him for furnishing us with such valuable information.

FALLACY OF HAWLEY'S DIAGRAM.

Before giving a full account of the conclusions which I arrived at from Dr. Williams' measurements I believe it will be well to show first that the accepted construction of Hawley is not correct. In his method the "Bonwill triangle" forms the basis of construction, and to obtain the outline of the arch the greatest mesio-distal diameter of the crowns of the teeth is to be first measured. Then with the combined widths of the central, lateral, and cuspid as a radius, and B (Fig. 1) as a center, the circle A J C H is drawn, and on each side of point A an arc is laid off, equal in length to the radius. Thus the points J and H are obtained. Drawing a diameter through A, the point C is obtained, which is the apex of the isosceles triangle C E D, formed by a tangent to the circle at A and the lines drawn from C through the points J and H. This triangle is termed an *equilateral triangle* in Johnson's "Operative Dentistry," which is, however, not correct, because one-half of the arc J A H is the measure of angle J C H, and since the arc J A H is equal in length to twice the radius, the angle J C H is equal to one radian,* or 57.272°, while we

FIG. 1.



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* A radian is an angle at the center of a circle which is subtended by an arc equal in length to the radius.

know that each angle of an equilateral triangle measures 60°. This, however, may be an error in technical terms, but assuming the correctness of the construction so far, lay off A I equal to C E, and with I as a center and I A as the radius draw the circle A F G. Then, making A a vertex, inscribe the equilateral triangle A F G into that circle. Drawing J F and H G, the curve F J A H G will represent the normal dental arch. The triangle A F G is assumed to represent Bonwill's triangle.

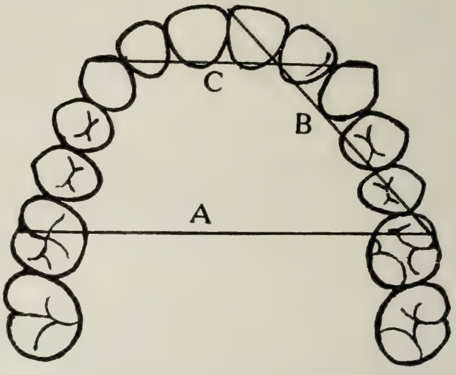
The fallacy of this construction is evident, for there is no proof of the hypothesis that the radius of the curve of the anterior teeth is equal to the combined widths of the central, lateral, and cuspid, and if the arch obtained by this method is compared with the deductions from Williams' measurements, it will be found to be too narrow and very much elongated. Another fault of this construction is the use of Bonwill's triangle in the equilateral form. It must be borne in mind that the diagram obtained by geometric construction is an orthographic projection of the arch upon a plane parallel to the general plane of occlusion, so naturally Bonwill's triangle, which in its original position lies on a plane inclined to the first plane mentioned, cannot appear in its original form, but it should present as an isosceles and not an equilateral triangle.

The fact that it is possible by the aid of the compass and the ruler to draw a curve which is similar in outline to the normal arch, does not solve our problem —the truth must be obtained by careful observation and measurement of natural arches; when sufficient reliable data are so obtained, the general rules which will apply to all human arches can be laid down.

ANALYSIS OF WILLIAMS' MEASUREMENTS.

Dr. Williams made three important measurements on a large number of natural arches, as shown in Fig. 2, in which the inscription explains these three essential measurements.

Fig. 2.



A = the distance from the buccal groove of the right first molar to the buccal groove of the left first molar.

B = the distance from the buccal groove of either first molar to the median line between the two central incisors.

C = the distance between the points of the two cuspids.

In Fig. 3 are tabulated the measurements of 54 arches, which were taken from Williams' article on "Determining the Shape of the Dental Arch" in the July issue of the Dental Cosmos.

A close analysis of these figures reveals important relations to us. If measurement B for each arch represented in the table is squared and the square root of twice the number thus obtained is taken, it is found that the result strikingly corresponds to measurement A. What does this indicate? It indicates that the triangle whose base is the measurement A and whose vertex is on the median line between the two central incisors is a 45° right triangle; and also that a circle whose center is at the intersection of line A and the median line, and whose radius is one-half the line A, will pass through the buccal grooves of the two first molars and the point between the two central incisors.

This is an extremely important relation—for, as will be shown later, it is possible to determine the relation between the first molars with mathematical accuracy; and using this principle the orthodontist can bring the molars within a

FIG. 3.

MEASURED VALUES (WILLIAMS)				COMPUTED VALUES			
REFERENCE NUMBER	A	B	C	B^2	$2B^2$	$\sqrt{2B^2}$	$\frac{C}{A} = \sin\theta$
1	56	40	36	1600	3200	56·56	·643
2	60	42	38	1764	3528	59.39	·633
3	58	41	37	1681	3362	57.97	·672
4	56	40	35	1600	3200	56·56	·625
5	54	38	34	1444	2888	53.74	.629
6	56	40	36	1600	3200	56.56	.643
7	53	35	34	1225	2450	49.49	·639
8	65	45	40	2025	4050	63·64	·615
9	54	40	35	1600	3200	56.56	.648
10	62	45	37	2025	4050	63·64	·597
11	54	40	34	1600	3200	56·56	·629
12	56	40	36	1600	3200	56·56	·643
13	57	47	39	2209	4418	66·64	·684
14	56	40	36	1600	3200	56·56	.643
15	52	39	34	1521	3042	55.15	·654
16	59	39	36	1521	3042	55·15	·610
17	54	39	33	1521	3042	55·15	·611
18	60	41	37	1681	3362	57·97	·616
19	57	42	38	1764	3528	59.39	·666
20	55	38	37	1444	2888	53.74	·673
21	60	42	39	1764	3528	59·39	.650
22	57	43	35	1849	3698	60·81	.614
23	57	41	37	1681	3362	57·97	·649
24	55	47	37	2209	4418	66·64	·673
25	54	39	37	1521	3042	55·15	.685
26	51	39	34	1521	3042	55.15	·666
27	53	39	34	1521	3042	55·15	·639
28	55	42	39	1764	3528	59.39	·709
29	50	38	28	1444	2888	53·74	.560
30	52	41	36	1681	3362	57·97	·696
31	58	44	38	1936	3872	62·22	·655
32	54	37	34	1369	2738	52·32	·629
33	57	49	37	2401	4802	69·29	. 649
34	58	41	37	1681	3362	57·97	·672
35	58	41	36	1681	3362	57·97	·621
36	58	42	37	1764	3528	59·39	·672
37	65	46	41	2116	4232	65.05	·631
38	61	41	39	1681	3362	57·97	·640
39	55	38	35	1444	2888	53.74	.636
40	58	45	38	2025	4050	63·64	.655
41	56	38	36	1444	2888	53·74	.643
42	56	39	36	1521	3042	55.15	·643
43	48	34	33	1156	2312	47·11	·687
44	56	46	36	2116	4232	65.05	.643
45	54	39	34	1521	3042	55.15	·629
46	56	43	36	1849	3698	60.81	·643
47	56	40	36	1600	3200	56.56	.643
48	52	44	35	1936	3872	62.22	.673
49	55	42	35	1764	3528	59.39	·636
50	59	43	38	1849	3698	60·81	·644
51	56	38	35	1444	2888	53·74	.625
52	49	38	33	1444	2888	53·74	·673
53	52	40	33	1600	3200	56·56	·634
54	56	40	36	1600	3200	56·56	.643

fraction of a millimeter of their proper position.

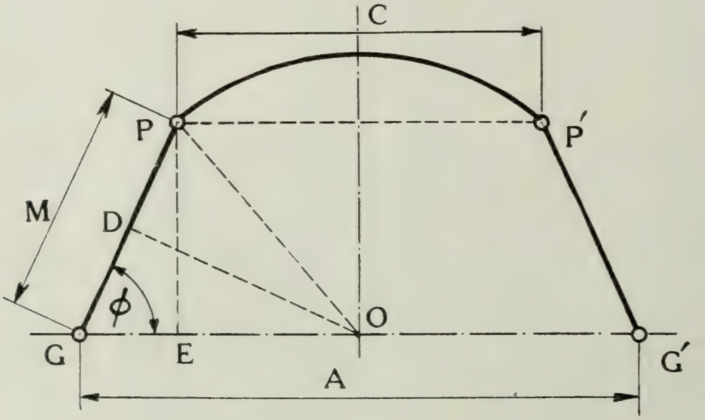
It must be remembered that the arches whose measurements are given in the table are not all perfect arches, and that the millimeter is a very small unit; so that even though the measured and computed values of A show a difference of from 1 to 5 mm. we are justified in stating that the above relation exists in normal arches.

This, however, is not the only point that is of interest to us. Dr. Williams explained that a constant relation exists between measurements A and C, or, in other words, the cuspids occupy a definite position with respect to the molars. He made no attempt to fix these teeth in their respective positions; he only gave general facts about the form of the arch, which, however, does not enable anyone to construct an arch for a particular case. He also showed that the prominent members of the profession greatly differ in their conceptions of the shape of the arch. With such reliable data at hand, there should be no difference in opinion regarding this important problem, and I hope that there will be no disagreement in the future.

From the dimensions A, B, and C the position of the cuspids cannot be determined; another measurement is needed. This other measurement is the distance from the point of the cuspid to the buccal groove of the first molar of the same side. It would be well to take this measurement for all arches represented in the table, but since this seems to be an almost impossible task, an average value obtained from Black's "Dental Anatomy" will be used in the further analysis.

When the values of A in the table are examined, it is found that the most frequent value is 56 mm., so that it can be safely assumed that the average width of the arch is about 56 millimeters. The mean value of all the A measurements is 55.94 mm., therefore our assumed value represents a fair average. It will also be noted that the value of measurement C which most frequently occurs in connection with that value of A, is 36 mm.

Fig. 4.



Let M = the distance from the point of the cuspid to the buccal groove of the first molar of the same side. It is a recognized fact that the distal half of the cuspid, the buccal cusps of the two bicuspids and the mesio-buccal cusp of the first molar lie approximately on a straight line, therefore the value of M can be calculated from the average measurements of the greatest mesio-distal diameters of those teeth, as given in Black's "Dental Anatomy."

The average mesio-distal diameters of the teeth are as follows:

Central incisor	9	millimeters
Lateral incisor	6.4	"
Cuspid	7.6	"
First bicuspid	7.2	"
Second bicuspid	6.8	"
First molar	10.7	"

Therefore the average value of M is the sum of the following:

Distal half of cuspid	4.1	millimeters
First bicuspid	7.2	"
Second bicuspid	6.8	"
Mesial half of first molar	5.4	"
	M = 23.5	"

In the above calculation the distal half of the cuspid was assumed to be slightly larger than its mesial half. The value of M may not be absolutely correct, but the error cannot be greater than a fraction of a millimeter.

In the diagram Fig. 4 let P and P′ represent the position of the points of the cuspids, and G and G′ indicate the position of the buccal grooves of the two first molars.

As it is shown above, in the average arch

$$C = PP' = 36 \text{ mm.}$$
$$A = GG' = 56 \text{ mm.}$$
$$M = PG = 23.5 \text{ mm.}$$

From O, the midpoint of A, draw O P, then erect the perpendiculars P E and D D to lines G G′ and G P respectively.

Let ϕ = the angle included by lines P G and G G′:

Then $M \cos\phi = GE$

But $GE = \frac{A-C}{2}$

$\therefore \quad M \cos\phi = \frac{A-C}{2}$

Hence $\cos\phi = \frac{A-C}{2M}$ 1.

Again,

$GO \cos\phi = GD$

But $GO = \frac{A}{2}$

$\therefore \quad \frac{A}{2} \cos\phi = GD$

Hence $\cos\phi = \frac{2GD}{A}$ 2.

Equating the values of $\cos\phi$ as given in equations 1 and 2,

$$\frac{2GD}{A} = \frac{A-C}{2M}$$

From which

$$GD = \frac{A}{4M}(A-C)$$

Substituting the average values of A, C, and M into this equation,

$$GD = \frac{56}{4 \times 23.5}(56-36)$$
$$= 11.9 \text{ mm.}$$

Here again we arrive at another important relation. The value of G D is very nearly equal to one-half that of P G (23.5 mm.), which suggests that the triangle O P G is isosceles, where O G = P O or very nearly so.

From this it may be concluded that the points of the cuspids also lie on the circle which passes through the buccal grooves of the two first molars and the median point between the central incisors.

Since it is proved that three points of the anterior curve of the arch lie on the circumference of a circle, the whole of that curve can be considered to coincide with a part of the circumference of that circle, without appreciable error.

Now that we have analyzed the measurements of a large number of human arches, and have come to a conclusion as to the relative position of the teeth, let us see how much we may rely upon the data which form the basis of this analysis. For this reason let us turn again to our table in which we see that the computed value $\sqrt{2B^2}$ very nearly equals the measured value of A. In the great majority of cases the difference between these figures does not exceed 2 or 3 millimeters, but it must be borne in mind that even this small difference is a magnification of the true error. The true error comes from a slight difference between the true and measured values of A and B, because the fractions of millimeters were discarded when those measurements were taken. The true error is magnified because any error that was made in making measurement B is increased in the process of calculation, so that the "apparent error" is $\sqrt{2}$ times the true error. We must also remember that these arches only approximate the ideal normal arch, and that there is more or less variation from the normal in almost every case.

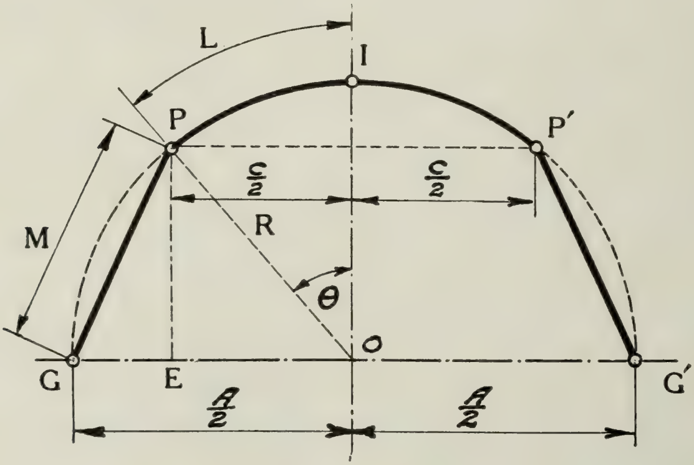
An objection may be raised to the method employed in proving that the points of the cuspids also lie on the circumference of the circle, which is determined by the molars and the incisors. While I agree that it is not truly scientific to employ such methods, the result is really satisfactory, since the few arches which I have measured gave similar results. There can be no doubt that the measurements of Black were made with the greatest care, and since the average values of Williams so closely approximate those of Black, equal weight can be given to his measurements, and this method of supplying the missing measurement becomes permissible.

Thus it appears that the data are more accurate than is shown at the first glance—therefore the dental arch is subject to rigid mathematical treatment.

DEDUCTION OF THE FORMULÆ.

It is not expected that the everyday practitioner should go into the minute mathematical details of the dental arch. It is a complex problem, and if rigid theoretical results are obtained, the knowledge of an engineer would be required to solve the lengthy formulæ. It is the aim of the writer to give working formulæ to the dental profession which will be within the reach of all its members. For this reason a certain degree of empiricism is introduced into the method of arriving at the required results, so that while the formulæ are sufficiently accurate for all practical purposes, no unnecessary amount of mathematical work will be required to calculate the needed measurements.

Fig. 5.



The starting-point of the deduction is the truth that the five points, namely, the buccal grooves of the first molars G and G′ (Fig. 5), the points of the cuspids, P P,′ and the median point between the two central incisors I are on the circumference of the circle whose center O is at the point of intersection of the median line I O, and the line joining the buccal grooves of the first molars G G,′ and whose diameter is the length of the latter line.

In Fig. 5 the length of the arc P I (or L) is equal to the combined widths of the central, lateral, and the mesial half of the cuspid; and the angle θ is the angle subtended by arc L at the center of the circle.

The radian was defined as the angle at the center of a circle which is subtended by an arc equal in length to the radius.

Therefore $\theta = \frac{L}{R}$ radians

where R represents the radius of the circle. If P E is drawn perpendicular to G G′

$$EO = R \sin \theta$$

and $GE = GO - EO = \frac{A}{2} - R \sin \theta$

$PE = R \cos \theta$

also

$$\overline{PE}^2 = M^2 - \overline{GE}^2 = M^2 - \left(\frac{A}{2} - R \sin \theta\right)^2$$

Hence

$$R^2 \cos^2\theta = M^2 - \left(\frac{A}{2} - R \sin \theta\right)^2 \quad \textbf{3.}$$

Remembering that

$$\frac{A}{2} = R$$

equation 3 can be solved for the value of sine θ. Thus

$$\sin \theta = 1 - \frac{M^2}{2 R^2}$$

If this equation is divided by the equation

$$\theta = \frac{L}{R} \text{ radians}$$

we get

$$\frac{\sin \theta}{\theta} = \frac{\left(1 - \frac{M^2}{2 R^2}\right)}{\frac{L}{R}}$$

$$= \frac{R}{L} - \frac{M^2}{2 RL}$$

It is a well-known fact in mathematics that the ratio of the sine of an angle which constantly changes, to the angle expressed in radians, is very nearly a constant, provided the angular change is small. This relation is used in the derivation of many physical laws, as for instance the law of the pendulum. In the arches of different individuals the angle θ may vary, but the variation must be necessarily small, so that we may consider

$$\frac{\sin \theta}{\theta} = k \text{ (a constant for all arches)}$$

Therefore by substitution

$$k = \frac{R}{L} - \frac{M^2}{2 RL}$$

Solving this equation for R,

$$2R = kL + \sqrt{2M^2 + k^2L^2} \quad \textbf{4.}$$

Every member on the right-hand side of this equation is known with the exception of the term "k." This constant can be determined from the measurements of Dr. Williams. It is seen in Fig. 5 that

$$\sin \theta = \frac{\frac{C}{2}}{\frac{A}{2}} = \frac{C}{A}$$

If we turn once more to our table, in the last column we will find the value of sin θ for each arch. These values are very nearly equal and their average is .645. From a table of natural trigonometric functions the angle whose sin is .645 is found to be 40° 10′ or .701 radians.

Hence $k = \frac{\sin \theta}{\theta} = \frac{.645}{.701} = .92$

Substituting this value of "k" into the formula for R,

$$2R = .92L + \sqrt{2M^2 + (.92L)^2} \quad \textbf{5.}$$

It is evident that if L and M are known the radius of the circle can be calculated. The values of L and M can be obtained from the measurement of the teeth.

Even this simple formula, however, would be difficult for many practitioners to use. If we consider that in a very large percentage of cases the relative sizes of the teeth are constant, this formula may be further reduced to a still simpler one. While the simple formula gives the same results as the above formula, with but a slight error, it can be used only in those cases in which the anterior and posterior teeth are in normal proportion. If a case is presented for orthodontic treatment where the posterior teeth are large in comparison with the anterior teeth, formula 5 should be used.

The simple formula can be derived as follows:

We know that

$$\theta = \frac{L}{R}$$

hence $$R = \frac{L}{\theta}$$

but the average value of $\theta = .701$ radians.

$$\therefore \quad R = \frac{L}{.701}$$

or $$R = 1.43\ L \qquad \textbf{6.}$$

which indeed is a very simple relation.

PRACTICAL APPLICATIONS.

In prosthetic work this formula can be applied for the determination of the normal arch for full upper and lower dentures. Since sets of artificial teeth are made in normal proportion the simple formula will suffice. From the careful measurements of the mesio-distal diameters of all teeth the distances L and M can be easily calculated for a particular case, making a slight allowance for the greater distal half of the cuspid. Then R is calculated from the formula

$$R = 1.43\ L.$$

When the value of R is known for the case in hand, the outline of the arch can be constructed as follows: To any convenient line, G G′ (Fig. 5), erect a perpendicular (O I) at a suitable point (O). With the foot of the perpendicular (O) as a center, draw a semicircle (G P I P′ G′) whose radius to scale is the calculated value of R. Then from G and G′ strike an arc with a radius equal to the calculated value of M, to cut the circle at points P and P.′ The discontinuous curve G P I P′ G′ is the outline of the normal arch for the particular case. This outline can be transferred to the lower waxes by a bristol-board pattern, after the compensating curve has been determined by the usual method.

The value of this formula is far greater in connection with orthodontic work. When a badly deformed arch is to be corrected, it is a matter of importance to predetermine the proper width of the normal arch, or, to be more specific, the proper position of the first molars. If the molars are too far apart the arch will be wide and the interproximal spaces too large, or if they are too close to each other the teeth will be crowded together, which evidently will result in a certain degree of deviation from the ideal shape of the arch. If the molars are properly placed the teeth can be arranged to closely approximate ideal conditions in occlusion, proximal contact, and arch outline.

By the use of formula 5 or 6 the proper outline of the arch can be predetermined, from which the amount and direction of movement of each tooth can be readily ascertained and the appliances designed accordingly.

The dimensions A, B, and C can be calculated from the value of R, and no orthodontic treatment should be considered complete until the measured values correspond to the computed values of these distances. These dimensions are calculated from R as follows:

$$A = 2\ R$$

$$B = \sqrt{2}\ R = 1.414\ R$$

$$C = 2\ R \sin\theta = 2 \times .645\ R = 1.29\ R.$$

I hope that in this article I have given the long-sought information about the shape of the normal arch, and trust that the formulæ will be found useful in practice.

626 BERGEN AVE., NEW YORK CITY.

New Instruments for Ionization.

By ISIDORE CLIFFORD, L.D.S., R.C.S.Eng., London.

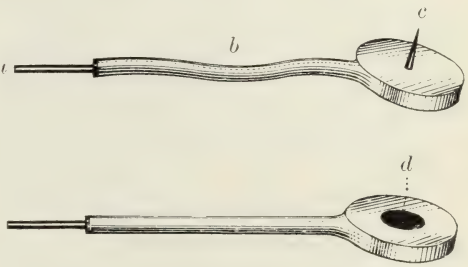
OF all operations dentists now have to perform, there is not one that is more tedious and tiring than careful ionization. Holding an instrument like a pencil for several minutes absolutely still, time after time, watching that the point does not move and being constantly on the alert for fear the patient should not keep still, is very trying to the operator.

After many experiments with self-supporting points which have been failures, I have now succeeded in making instruments that our patients themselves can hold with the greatest ease in exactly the position desired.

These instruments are quite easily made by the dentist. I shall describe the manufacture of the pattern I use the most, and every dentist, once having comprehended this description, can make for himself the designs he fancies.

Take a piece of sheet zinc (any thickness), cut a disk about half an inch in diameter, and pierce a hole in its center. Into this hole solder (with tin solder) a zinc point projecting half an inch. Take about four inches of thin flexible cable (as used for electric work) and strip off the outside cover, leaving only the copper wires; solder these wires at the back of the zinc disk and solder to the other ends of the wires a solid copper wire to fit the ordinary terminal. Take about three inches of the smallest sized rubber tubing ($\frac{1}{8}$ in.) and slip it over the flexible wires until it touches the disk, then cover the disk and the disk end of the rubber tube with wax, leaving only the wire point projecting. Vulcanize with soft velum rubber. (See figure.) Thus there is produced a flexible instrument entirely insulated, except as to the point, opposite which is a flat surface like a coin which when placed in position can be held there by the patient's finger.

I use many shapes and sizes, some of zinc, some of platinum, and some of copper; some with long fine points that go almost to the ends of the roots in dead teeth, for sterilization, and some without points at all for gum treatment. Those without points have a portion of the zinc disk exposed so that it can be placed upon a pad of lint which has been saturated with the solution to be used. (See *d* in the figure.) These instruments also are held in position by the patient.



a, Copper wire. *b*, Rubber. *c*, Zinc point. *d*, Zinc disk.

The method of using is quite simple. After bending, if necessary, the wire point, and placing it in position, the patient's finger is guided to the back of the disk or rubber pad and placed on it, then the thumb is guided to a convenient resting-place on the face or chin and the patient can thus hold it for fifteen minutes if necessary without fatigue.

One great advantage is that patients need not keep still, for the hand follows every movement of the head. In fact, the patient is usually able to converse while the treatment is in progress; also the dentist's hands are free, enabling him to look after the battery, etc.

I take pleasure in giving this method to the profession, in order that this beneficial work may go on, and my *confrères* may be thankful to be able to "look on" during this tedious but most necessary work.

20 Grosvenor st., W.

CORRESPONDENCE

"Type *vs.* Temperament in the Selection of Teeth."

To the Editor of the Dental Cosmos:

Sir,—Will you allow me a little space for comment on the very interesting article by Dr. Norman S. Essig which appears in your September issue?

Dr. Essig gives me credit for "establishing the three great types which obtain in the evolution of all human dentures" as a scientific basis for classification, but I cannot quite follow him when he says that this "puts a foundation under the temperamental theory." The most fundamental claim of the temperamental theory is that tooth form corresponds with certain physical characteristics, prominent among which is shape of skull and color of skin, hair, and eyes. As I have shown that the forms of teeth do not necessarily bear any relation to either of these characters, I had thought that so far from putting a foundation under the temperamental theory the facts had rather effectually knocked the foundation out.

Dr. Essig admits that "We may be certain that there can be no temperamental classification with respect to the three basal types the existence of which is attested to and borne out by the scientific study of all the great collections of crania in the world." But the advocates of the temperamental theory have always claimed that the evidence for that theory was strongest and clearest in the most pronounced types, and that the difficulties began with the blending of types. This is hardly in accord with Dr. Essig's further statement that the word "temperamental" in all probability owes its application to the innumerable modifications of the great basal types.

It is altogether probable that the application of the temperamental theory began with the observation of a comparatively few instances. It is the old mistake of generalizing on insufficient data. Most errors in the study of nature have had a similar origin. A certain number of men in influential positions give their adherence to the new theory. They observe and mark the facts which apparently confirm their views, and ignore the exceptions although the exceptions may be the more numerous. Others observe the exceptions and hold modified views. Hence arises confusion and more or less contradictory teaching. I have long observed these differences of opinion among those who teach the temperamental theory of tooth form. These differences of opinion and statement among those who just now are trying to say a good word at the obsequies of this theory in the fond belief that it is not dead, are rather amusing.

I have talked with a great many dental students and graduates on this subject, and I have yet to find one who did not admit that he had only a hazy and confused idea of what the temperamental theory meant. The reason for this is that the teachers have had only hazy and confused notions on the subject, with no fundamental agreement among themselves when it came to a practical application of their views.

The discovery of the three basal types of teeth makes it easy to establish in the dental student's mind the fundamental facts about tooth form. There is no confusion and no room for differences of opinion on this point, and that is of the greatest importance in matters relating to teaching. And what is of even greater practical importance, these discoveries enable the average dental student, under competent teachers, to embody the sciencetic facts discovered in practical prosthetic service of the highest artistic merit, an attainment heretofore possible only to a very few highly gifted men, specially trained by long study and experience, like Dr. Essig.

When Dr. Essig asserts that "A high order of vitality or a lack of it is never expressed by a single tooth, nor could a single tooth betray a highly organized nervous mechanism, or the reverse expressed by the terms phlegmatic or plethoric," he has surrendered the last trench of the temperamentalists.

I will even admit that I am not quite prepared to say that I would go as far as he does in all aspects of that statement, but that admission on my part is no acknowledgment that I think there is anything worth saving in the temperamental theory so far as it is applied to dental prosthesis.

Dr. Essig's statement that *"human teeth are a law unto themselves"*—a statement which he emphasizes by placing it in italics, will probably sound startling and somewhat unscientific to many, but there is a very real sense in which it is true, and the statement is important because it bears directly on certain confusing problems of inheritance. Many years ago, in discussions with the late Prof. Heitzmann, I called attention to the fact that while all the tissues of the human body, the enamel of the teeth alone excepted, are subject to endless changes and modifications through their governing cellular elements, the enamel cap, which determines the form of a tooth, can undergo no anatomical or true physiologic change because the cellular elements from which it is formed completely disappear when the formation of the tissue is finished. Whatever form is given to the tooth before its eruption so must it remain through life, subject only to the changes of wear and decay. But it is a matter of constant observation that other features which are more or less discordant or inharmonious in early life often become more harmonious with advancing years. This is probably due to some governing principle of the mind over the body, and is especially noticeable in persons who develop strong and fine characters.

The frequent evidence of disharmony in the teeth is, of itself alone, quite sufficient to disprove the claims of the temperamental theory, and a careful study of these disharmonies is most important to the successful practice of dental prosthesis. In whatever sense the teeth are a law unto themselves, it becomes all the more important, because of this, that we find out all that we can about the exceptional law.

"It has also been demonstrated," says Dr. Essig, "that there are many types resulting from the blending of these standard forms that cannot be classified with any one of the three distinctive types upon which we depend as a basis of classification," and he makes his statement a little more emphatic by adding, "Nothing has been done to show how these nondescript teeth are related to the true types."

I am afraid that I shall have to take very positive issue with that statement.

In a paper which I read before the First District Dental Society of the State of New York in 1914 I analyzed the elements of design in the three basal types of human teeth, and I showed how those elements of design, acting and reacting on each other, could produce any conceivable form of human tooth. Within the range of normality there are no "nondescript" human teeth. They are all evolved under the law of those basal forms. The influence of each basal form can be fairly accurately determined in the great majority of cases, and in most instances one of the basal forms is dominant. It is just in these blended forms that have so confused and troubled the temperamentalists that the discovered facts about typal forms are of the greatest value. The selection of strong typal forms of teeth for strong typal forms of faces is very easy when once the principle of harmony between the two has been pointed out. The blended forms of faces are not so easy to analyze and place. But here an entirely new factor comes in to simplify the problem for the dentist.

In both faces and teeth, the farther the departure from typal forms—in other words, the more they are blended by crossing—the more alike they become. The more difficult it is for a dentist to determine to which of the three typal forms a face should be referred, the less important it becomes to select a tooth closely resembling a typal form.

The blended forms in the three classes naturally resemble each other much more than the typal forms do, and thus, although it is desirable, if it can be determined which of the typal forms is dominant in any given blended face, to select a form of tooth from the corresponding class, any one of the extreme blended forms of teeth from either class will produce pleasing, satisfactory results. You will, at least, get what Dr. Essig calls "harmonious discord," and this, in his opinion, "is the highest artistic expression of dental prosthesis."

Now, there is nothing of all this in the teaching of the temperamental theory, nor in any artificial teeth that have ever been made in the effort to meet the conditions of this theory.

The one fundamental fact that it is very important to get clearly before the profession is that *there is no form to be found in normal human teeth which cannot be matched in artificial teeth by a blending of the elements of design seen in the three typal forms.*

I am, of course, perfectly aware that after everything possible has been done to give the profession a scientific system of artificial teeth, it still remains true, as Dr. Essig says, that the specialty of dental prosthesis "will always require artistic skill and manipulative ability on the part of the operator," if fine results are to be achieved.

When it comes to any expression of opinion on the esthetics of dental prosthesis, Dr. Essig is in his own field with the solid ground of personal acquirement under his feet. He is every inch the artist both by natural endowment of faculties and long cultivation of those faculties. When he says, "If we create an harmonious discord we can at least produce a highly artistic result that does not attract attention," he is stating, when his words are rightly understood, what should be the highest aim in the construction of artificial dentures.

"Harmonious discord" is an expression that only an artist would think of using. The elements of *harmony* involved in such an expression have relation, first, to the correspondence between the outline of the upper central incisor and the contour of the patient's full-view face, and second, to the alignment of the teeth with reference to the profile outline of the face.

The "discord" which modifies that harmony, and thus removes the artificial denture from that ideal perfection which is so rarely found in nature as to be conspicuous—and therefore not a good imitation of the average in nature—consists in all those *little* imperfections in form and color which artists often refer to as "the accidents of nature."

I have seen these accidents of nature so perfectly imitated in Dr. Essig's work that it was not possible for me to tell, without close examination, whether the specimens were natural or artificial.

But the artist introducing these small defects in imitation of nature should always have, as a solid esthetic foundation for the exercise of his personal skill in art, tooth forms that harmonize with the face of his patient.

J. LEON WILLIAMS.

NEW YORK, N. Y.

"Malocclusion as a Problem in Pathology."

To the Editor of the Dental Cosmos:

Sir,—I wish to correct a statement that if left unchallenged may lead to misinterpretations of my convictions relative to certain etiological factors of malocclusion. In your closing discussion following the paper "Malocclusion as a Problem in Pathology," published in the Dental Cosmos for October, you state, on page 1017: "In studying the cases of infants in which the arch was different from its normal form, he (Hellman) traced the condition to the mother's breast, and the molding effect of the nipple on the mouth of the infant —an influence that was mechanical." True, the *mechanical* influence *was* at first the directive stimulus of the trend of my thoughts on this subject. But, after considerable observation and extensive studies, my views assumed a broader scope and I began to search for the causes that lay beyond the inability of mothers to nurse their infants and for the reason why bottle-feeding has to be resorted to in such numerous instances.

In my paper published in the Dental Cosmos for September 1914 I stated that "The fact that the bottle has to be resorted to would imply a disturbance in the mother's condition which must be accompanied by some consequences in the infant's nutrition during the period when the milk begins to be affected until the bottle is prescribed. To what extent the degeneration of the mother's milk may influence the infant's health is difficult to say in the darkness of our present ignorance. But that there is a disturbance present is amply brought to our notice by some investigators, and it must be attributed to improper nutrition. These disturbances may continue and develop to a degree as to present such dystrophies as rhachitis, as shown by T. Wood Clark, or they may be intercepted at any stage during the course of development of the disturbance. The dystrophy of rhachitis is shown by Kassowitz to exist to the extent of 90 per cent. in infants during the beginning of the teething period."

In my paper published in the Dental Cosmos for February 1916 I came to this conclusion: "Of the numerous factors that enter into the etiological problem of malocclusion of the teeth, *internal secretion* is the one which may, in a large measure, account for many mysteries that perplex the orthodontist. The appreciation of the paramount importance of this factor will be evident in proportion as more knowledge is gained with reference to the profound working of this most wonderful system of glands."

You will therefore see that the *mechanistic* view, though entertained at the very outset of my studies, was soon outweighed by the subsequent development of this problem. My convictions thereupon assumed an aspect in accord with your contentions as well as with the views held by the authorities quoted by you.

I wanted this point cleared so as not to be misjudged by the statement referred to above.

Sincerely yours,
Milo Hellman, D.D.S.
New York City, Oct. 12, 1917.

Dental Preparedness in the Army.

To the Editor of the Dental Cosmos:

Dear Sir,—Since the beginning of the present hostilities I have carefully followed the organization of the Dental Reserve Corps, the creation of which, no doubt, was fraught with many difficulties, some seemingly insurmountable. However, many were so patent, and apparently so avoidable, that I am convinced it was due to the exigency of the times and the imperfection of human machinery that they were not avoided.

Now that the organization has taken some definite shape the weak places should be strengthened by those forces designated for the task. The Preparedness League of American Dentists is rendering valuable aid in co-ordinating the dental forces of our country, but further action is demanded, especially from Washington, to properly meet the conditions that will exist.

Your September editorial in the Dental Cosmos suggests two solutions to the problem:

First, that dental examination of candidates for enlistment be made not by the medical but by the dental staff. For decided results this work should have been done by dentists long ago, and even at this late date, if the plan is put into operation, army and navy efficiency will be accelerated.

I think your other solution of the problem comes too late to have much bearing, for by the time the law is established to provide civil dentists for recruits at the cantonments, the major portion of the army will be on the soil of France.

Our Government is aware of the fact that the dentist is essential to a well-organized war force, and that an army with defective teeth is an army with impaired health; still, the contemplated dental corps will not be sufficiently adequate to combat this enemy of health.

The ratio the Government provides—that is, one dentist to one thousand enlisted men—is sufficient evidence of the fallacy of a program by which only two hours of dental service will be rendered to each man during the year.

There is another feature of dental preparedness that needs revision. The Government is weaving a faulty fabric by not commissioning more experienced men in this arm of the service. The dental organs of millions of young men will be under the care of dentists with little or no postgraduate experience. Experience is acquired by mistakes, and the soldiers will have to bear the consequences of this schooling.

The field is a vast, wonderful, and fertile one for the untried dentist, but what of the harvest? Innumerable foci of infection, pyorrhea, and broken health.

The men who are being called to this service are good, and of the virgin forest, but to build an efficient dental corps we need more of the seasoned timber.

Frank P. Kehoe, D.D.S.

Savannah, Ga., Sept. 18, 1917.

PROCEEDINGS OF SOCIETIES

Conducted by L. PIERCE ANTHONY, D.D.S.

Dental Society of the State of New York.

Forty-ninth Annual Convention, held at Rochester, N. Y., May 10 to 12, 1917.

THURSDAY—*Morning Session.*

THE forty-ninth annual convention of the Dental Society of the State of New York was held on May 10, 11, and 12, 1917, at Rochester, N. Y.

The meeting was called to order by the president, Dr. Robert Murray of Buffalo, on Thursday morning, May 10th.

The divine blessing was invoked by Rev. WALDO C. CHERRY.

President Murray then introduced the mayor of Rochester, Hon. HIRAM H. EDGERTON, who made the following

Address of Welcome.

Mr. President and members of the New York State Dental Society,—It has been my privilege upon a great many occasions in recent years to appear before conventions of this character and bid them welcome to Rochester. It seems to me it is very fitting that at this time you should hold your meeting here. We are grateful to you for coming. We old fellows are largely creatures of habit, and they tell me that for about fifty years you met in the city of Albany. We are grateful also to the city of Buffalo for waiving its claims and permitting you to come to us. We will let you go to Buffalo if you want to, once, but I think after this convention—at least if you had postponed it for a couple of weeks until all our gardens are in bloom, for they have been delayed this year—your conventions would be held hereafter in Rochester.

We have a very beautiful city. If you could be here in a couple of weeks from now, we would show you truly the Flower City. In the early days of Rochester we were called the "Flour City," because its chief industry was the manufacture of flour. Today, while that business is as great as it ever was, it is entirely overshadowed by other industries and has been almost forgotten. Later, Rochester became famous as a city where flowers grow.

We stand almost at the head of all the cities in the state in area and the beauty of our park system, having about 2000 acres of parks. One of our smaller parks, which we call Highland Park, is a bower of beauty all the year round. In two weeks from now there will be many varieties of lilacs there. I have seen on what is called "Lilac Sunday" 50,000 people in that park; then we have the rhododendrons. The first flowers that creep above the ground are in that park; there are there many hyacinths, and 300 varieties of trees—so that the place is well worth a visit. We trust you will not let your officers keep you too busy here, but that you will take time to go about Rochester and see some of the beautiful things.

It is almost impossible for a Rochesterian to understand why a New York State convention should go to any other city, and perhaps some of you may think so too, although I may be prejudiced. The Rochester people are a unit on Rochester. We may have some little differences among ourselves, but let anyone attack Rochester anywhere, and the whole city will fight.

We are pleased to have you here, and trust your convention will not only be profitable, but pleasing and entertaining, and I am sure you will want to come again.

I feel quite sure that wherever you go in Rochester you will find a hearty welcome. I trust you will go about and see us as we are, and I hope you will want to come back again.

Ladies and gentlemen, I thank you.

Response.

The mayor's address of welcome was responded to by Dr. W. W. Walker, of New York, who spoke as follows:

Mr. President, ladies and gentlemen,—After the busy day yesterday at the dedication of the dispensary by our friend the mayor of this city, I thought this morning at breakfast that perhaps he would send his son, or one of his official family, and not come himself—but, Mr. Mayor, we are very happy to see you are the real mayor of this most beautiful city, and I know the city is proud of the manner in which you perform your duties, otherwise you would not be elected from year to year, as you are.

On behalf of the members of the Dental Society of the State of New York, and the visiting dentists from all over the United States, I thank you, sir, for this very cordial welcome. I also would thank the Chamber of Commerce for the very charming letter they sent the members, inviting them, and extending the good right hand of fellowship on this occasion. It said in that letter that they would give the dental profession an opportunity of catching on to what they called the "Rochester spirit." The Rochester spirit is the extending of the hand of fellowship to everyone who comes here. These conventions make everyone happy. You make us feel as if we were in your own home, and that is why Rochester has been so successful as a convention city. Everybody is welcome. The minute you arrive you are welcomed, and everyone is sorry to see you leave. That is the spirit of the citizens, the Chamber of Commerce, and the merchants—not for business only, but for pleasure.

Mr. Mayor and gentlemen, I thank you very much, and I hope, Mr. Edgerton, you will live long and happily; and when you are tired of the mayoralty of this city, we will send you on to Albany, and then to Washington.

The vice-president, Dr. Amos C. Rich of Saratoga Springs, took the chair, while President Murray read his address, as follows:

President's Address.

By Rob't Murray, D.D.S., Buffalo, N. Y.

To the Officers and Members of the Dental Society of the State of New York:

CHANGE OF PLACE OF MEETING.

Section 31 of the By-laws of this society provides that the Executive Council at each annual meeting before adjournment shall name the next place of meeting.

In conformity with this by-law your Executive Council at the last annual meeting decided that the 1917 convention be held in the city of Buffalo.

Another important dental convention scheduled for western New York was the union meeting of the Fifth, Sixth, Seventh, and Eighth District societies, which was to have been held in this city last November, in connection with the proposed dedication of the Rochester Dental Dispensary.

It soon became apparent, however, that the dispensary could not be completed in time to hold the dedicatory services in the fall of 1916, so it was sug gested that the union meeting of the districts be changed to Buffalo, and the state meeting to Rochester, thereby giving the dentists of the state an opportunity to be present at and participate in an event which I feel sure is destined to mark a new area in dental activities in western New York. The matter of the change of meeting-place was presented to the Executive Council of our State Society and the different executive bodies of the districts interested, and they, with almost unanimous consent, agreed to the change. This arrangement, however, presented legal technicalities which had to be considered, so it was decided upon legal advice to hold the first meeting of the Executive Council in Buffalo on the day previous to the opening of the general sessions, transact such business as is usually taken up at the opening session, and adjourn to meet in Rochester the following day.

In order to provide for any possible emergency in the future I would recommend that Sec. 31 of the By-laws be amended to read as follows:

> The society shall hold its annual meeting commencing on the second Thursday of May in each year at 10 A.M., and such other special meetings as may be necessary. The Executive Council shall name the next place of meeting.

It is with feelings of mingled satisfaction and appreciation that I welcome you to this, the forty-ninth annual meeting of the Dental Society of the State of New York—appreciation of the valuable services rendered this society by the efficient and able body of Rochester dentists, who have given unselfishly of their time and talents to the various duties assigned to them; and satisfaction at the thought that with their efficient support we have been enabled to present a program which I trust will meet the approval and commendation of the members of this society.

DEATH OF DR. R. H. HOFHEINZ.

While we rejoice at the prospect of a profitable and interesting meeting, yet there is sadness in the thought that in this his home city, where dental conventions seem incomplete without his genial presence, we miss the glad welcome, the warm handclasp, the wise counsel, and the loving fellowship of Rudolf Hofheinz.

In sacred memory he is with us today, and the inspiration of his life and his untiring labors in the interest of our beloved profession furnish us an example we do well to emulate.

Lives of great men all remind us
We can make our lives sublime,
And departing leave behind us
Footprints on the sands of time.

THE DISTRICT SOCIETIES.

It has been my privilege and pleasure during the past year to visit most of the district societies either in union convention assembled or individually, and while I have noticed a marked increase in dental activity throughout the state, yet the conditions to my mind have not reached that state of perfection which is so necessary and desirable in this day of large and ever-increasing opportunity.

We have practicing in New York State approximately 5500 dentists. Of this number we have upon the roster of the Dental Society of the State of New York about 1500 names; in other words, in this great Empire State, a name synonymous with twentieth-century attainments, three out of every four dentists have no interest in dental societies, are indifferent in their relation to those forces that count for progress and efficiency in dental science, and have not put their names on record as being interested in the solution of the many perplexing problems which we as a profession are endeavoring to solve.

Does this condition of affairs mean that the lofty tenets of our profession, for which our dental forefathers labored and fought so valiantly, are being sacrificed upon the altar of commercialism? Does it mean that a large majority of the profession are more interested in the financial side of dentistry than in their service to humanity?

This, to my mind, is one of the most serious problems which we, as a society, have to face, for there never was a time in the history of dentistry when the door of opportunity was so wide open, when the Macedonian call was so insistent, when the spirit of co-operation between the medical and dental professions was so cordial as it is today.

Never before in the history of our profession has the importance of our work more impressed the public, and enlisted the sympathy and co-operation of those forces that have enabled us to enter larger fields of usefulness, than at the present moment. How important it is, then, that we as a profession should present a united front in this great warfare against dental disease.

We are rapidly taking our place among the learned professions—are no longer looked upon as mere mechanics, but have earned the right of recognition as an important branch of the healing art.

A noted educator has said that the test of education is measured by the degree in which we are related to the great problems that are of communal interest. In this great democracy, where compulsory educational laws adorn our statute-books, we are encouraged by the manner in which the great forces of education and learning are leaving their imprint upon the life of the community. Fifty years ago, and even less, the care of the unfortunate and needy was left to the church and the charitably inclined. No efficiently organized system of relief existed; disease and poverty, except in a few isolated communities, were dealt with in a perfunctory and haphazard manner; but today we have come to realize that the individual unit of society is a community asset, the efficiency of which depends upon a sound mind in a sound body.

To maintain this desirable equilibrium science and art and all those forces which count for the uplift of humanity have been called upon, and are unselfishly contributing their share toward creating and maintaining efficiency standards.

Art is contributing her share in the free exhibition of the works of the great masters, and in encouraging the study of the beautiful and sublime in nature.

Music is contributing her quota toward the moral and spiritual uplift of the community by the introduction of the free public concert and the community chorus.

The historical societies and kindred institutions throughout the land are fanning the flames of patriotism and devotion in the hearts of a people who, though of various nationalities, are banded together by a tie of democracy that is embodied in our free institutions.

The health of the community is safeguarded by our efficient boards of health, our pure food laws, public playgrounds, public baths, and child clinics, where the unenlightened parent is taught the proper care and feeding of the infant committed to her care.

Medicine is contributing her share in developing and maintaining body efficiency in the free public clinic and in the campaign of public instruction upon those subjects which are of vital interest to the health and happiness of the community.

In view of the unselfish devotion to the cause of humanity above recounted, is it any wonder that dentistry during the last fifteen years has awakened to a sense of her obligation and the part that she is to take in the great work of community services?

That she has made good is too apparent to require extended discussion, as the evidences of the progress she has made in her own particular department of social service are about us on every hand. That the public at large has been impressed with the importance of our work is emphasized by the fact that dental defects are a barrier to the entrance upon not only the ordinary vocations of life, but also to the service of one's country in any great national crisis. About us on every hand we find communities and individuals who by their active co-operation and financial assistance have made it possible for our profession to enter new and larger fields, and serve humanity more efficiently than in the past.

SCIENTIFIC RESEARCH.

At no time in the history of dentistry has there been such concerted action in an endeavor to solve some of the intricate problems that confront us as a profession. Never before has such interest been aroused in the prosecution of scientific investigation, not only in the National and state societies, but in various local centers, where, under the direction of men whose minds are aflame with devotion to scientific progress and love for their profession, endeavors are being made to answer some of the perplexing questions asked by the medical profession and the laity.

At the 1916 meeting of the National Dental Association held in Louisville the House of Delegates adopted the recommendations of the Board of Trustees by a unanimous vote. These included making membership in the National Dental Association contingent upon the financial support of the Research Department by an increase of $1 in dues; this amendment, in accordance with the constitution, has to lie over for one year.

Dr. Price, in writing me under date of March 20th, informed me that trustees of the Research Institute, the officers and trustees of the National Dental Association, and the members of the Research Commission met in joint session in Cleveland on March 10th to consider recommendations made by the Carnegie Foundation, and to study means for the best possible development of the Research department.

At the above meeting the following resolution was unanimously adopted:

> RESOLVED, That it be recommended to the various state societies that their dues be increased one dollar per member for the support of the Research Institute, which amount shall be paid directly to the treasurer of the National Research Institute; that we further recommend, in those states where the dues have been raised for this purpose, that the treasurer or secretary of each state be requested to forward all research funds raised for this purpose directly to the treasurer of the Research Institute.

I am not unmindful of the fact that honest criticism has been aroused, and the question has often been asked whether the results so far obtained have warranted the expenditure of so large a sum of money in this particular department of dental society work. In rebuttal it is only necessary for us to turn back the pages of dental history and review the evidence therein contained.

Who of us is qualified to depict the probable status of dentistry today if such men as Black, Miller, Jenkins, Brophy, Truman, Talbot, Taggart, and a host of others whom I might name had not lived and labored among us? The investigations of the most of these men have been placed as a free-will offering upon the altar of dentistry, and posterity has incurred a debt which it will never be able to liquidate.

We have reached a stage in our professional development where we should be able to stand alone.

The time has come when this important work should be undertaken by the profession as a whole, and not depend upon gratuitous contributions to dental science by men who, after the arduous and exacting duties of everyday practice, are content to burn the midnight oil in order to solve some of our problems. Professional self-respect can only be maintained by every man doing his share, and this can only be accomplished by the equitable distribution of the burden over the entire profession as outlined by the Research Commission. I would therefore respectfully recommend that our State Society pledge not only its financial but its moral support to this important movement to which our representatives in the National Association have subscribed.

THE NEW DENTAL LAW.

New York State is to be congratulated upon having on its statute-books a new dental law which, according to competent critics, is a model of its kind, and far surpasses any dental legislation that has ever been enacted in this or any other country.

That it may have certain defects no one will deny, but as time progresses and these defects become more apparent, it is only reasonable to suppose that proper steps will be taken by legislative enactment to so amend the law that the interests of the public will be best served, and the honor and integrity of the profession jealously safeguarded.

The harmonious working of any legal machinery can only be accomplished after due trial, so that it is absolutely necessary that patience and sound judgment should prevail, in order that conditions as they present may be efficiently dealt with, to the end that harmony between the profession and the legal authorities may be maintained.

Already many instances of the automatic working of the law have been noted, and this without any legal pressure being brought to bear upon the offending individuals. That many glaring examples of illegal practice still remain is not denied, but as the forces behind the law become thoroughly organized, it is only reasonable to suppose that these offenders will be summarily dealt with.

To this end the department at Albany needs the active co-operation and assistance of every ethical dentist in the state in order that the law may be rigidly enforced throughout the entire jurisdiction of the State Society.

Considerable adverse criticism has been leveled at some of the provisions of the law, particularly that clause relating to annual registration. To my mind this is one of the most important provisions, and one that is calculated to do more toward the apprehension and conviction of illegal practitioners than any other law that has ever been enacted. By this provision the legal process is very much simplified, as it eliminates the necessity of procuring evidence in the case of any individual not legally registered.

THE DENTAL HYGIENIST.

Another section of the law that has received considerable adverse criticism is that clause creating the dental hygienist, many claiming that danger of illegal practice from this source will constitute a menace to the profession.

I am of the opinion that these fears are more imaginary than real, as no such abuses exist in the medical profession from the licensing of medical nurses, but, on the contrary, their services are considered a necessary adjunct in the successful and efficient treatment of disease. The oral hygiene campaign which has swept across this continent during the last few years has created a demand for this class of skilled service which can only be met by a properly trained assistant, and I predict that the time is not far distant when the up-to-date office will have upon its staff a skilled dental hygienist.

The law regulating this particular branch of service is sufficiently explicit and drastic to deter any individual from violating any of its provisions.

THE FOUR-YEAR DENTAL COURSE.

There is no branch of scientific teaching or training that has made more rapid and substantial progress during the last half century than dentistry.

When we consider that fifty years ago there was practically no dental literature, when we had but two dental schools in the country, with an eight months' course of instruction covering a period of two years, when preliminary educational requirements were not deemed necessary, when it was considered a better qualification to graduate from a reputable dental office than from a dental school, when more importance was placed on the practical than on the scientific side of dentistry—these facts, when viewed in the light of present standards, furnish us an adequate idea of the substantial progress that has been made in dental science.

The year 1917 is destined to mark a new era in dental teaching in our country. Beginning September 1917 there is to be inaugurated in the principal dental schools throughout the country a four-year course of instruction, with preliminary educational requirements which shall guarantee to the profession a class of men of superior mental equipment and training, whose influence upon the profession is bound to be of inestimable value in raising the standard of dentistry in this country.

In this connection it seems appropriate

to mention the good work which has been accomplished by the Dental Educational Council of America in the inspection and proposed classification of all the dental schools in the country, and in the recommendation of the committee on curriculum in relation to the four-year course.

The classification of dental colleges, to my mind, will not only do more toward attaining proper educational standards in various institutions of learning, but will hasten the day when the interchange of licenses between the various states will become an assured fact.

INDEPENDENT JOURNALISM.

This is a question of vital interest to the profession, and one that is destined to occupy an important position in dental society deliberations in the immediate future. I am of the opinion that the time is about ripe for organized dentistry to take a decided stand on all questions that have a bearing on professional standards. The time has arrived when the line of demarcation between professionalism and commercialism should be clear-cut and well defined.

This is not a mere question of sentiment, nor should it be an occasion for acrimonious discussion, but rather furnish an opportunity for calm deliberation on a subject that affects the very foundation of our calling.

Professionalism and commercialism are both legitimate, and each in its own particular field has a definite service to render, but the characters of those services are so incompatible with each other that any alliance between the two not only has a demoralizing effect, but lowers their standard of efficiency.

FIFTIETH ANNIVERSARY MEETING.

The year 1918 will mark the fiftieth milestone of dental progress in this state. No meeting in the history of the Dental Society of the State of New York will compare in interest and importance with that to be held in New York City next year—a meeting in which will be epitomized the results of the last half-century of progress and achievement in the dental art.

No branch of medicine can compare in degree and scope along lines of constructive progress in scientific investigation and preventive measures with dentistry.

We are fortunate in having with us men who have contributed much toward the elevation of dentistry to that high plane of professional achievement which we now enjoy, and no more fitting climax to a half-century's service to dentistry and humanity could be devised than that these men, who have contributed so much to dental history, should be honored in some conspicuous manner as seems best in the minds of the officers of the society in 1918.

It was my privilege, during the past year, to attend a testimonial banquet in New York City in honor of one of our charter members, who for thirty-three years had faithfully served our society as chairman of the Law Committee.

That he performed faithfully and well and with an eye single to the best interests of our society the arduous duties of his office is evidenced by the fact that there were present on that occasion over two hundred dentists from all parts of the country, who esteemed it a privilege to be present and assist in doing honor to Dr. Carr, who has served his profession so loyally.

ORAL HYGIENE.

The widespread interest in this subject that has been aroused in the minds of the laity is due in a great measure to the oral hygiene propaganda which has swept the country of late years.

This department of our society's activities should receive an ever-increasing amount of attention, for there is no more important field of usefulness than that which has to do with the dissemination of knowledge having such an important bearing on the health of the community.

The fruits that have attended our labors in the past are too apparent to require extended discussion.

The dedicatory exercises of the Eastman Infirmary in which we have just participated is but another evidence of the important position that dentistry occupies in community service. One of the encouraging signs of the times is the interest manifested in various centers by philanthropists who by their generous donations have made it possible for the dental profession to enter larger fields of public service, and Rochester is indeed to be congratulated that she has in her midst a man who has put such a tangible stamp of approval upon the great work you are endeavoring to do in this community. The dental profession owes these men a debt of gratitude that we shall never be able to pay.

Our State Society is to be congratulated that one of our members has measured up to the exacting standard needed to direct this important branch of public service, and I feel confident that I re-echo the sentiment of every member of this society when I wish Dr. Harvey J. Burkhart every success in the administration of this philanthropic enterprise.

LIABILITY INSURANCE.

In a paper entitled "The New Era in Dentistry: Its Relation to the Increase in Malpractice Suits," read before the First District Society on Dec. 4, 1916, by Bissell B. Palmer, Jr., and published in full in the *Journal of the Allied Dental Societies,* March 1917, the essayist presented in forceful argument the grave danger that menaces our profession as a result of recent scientific investigations, aided by the disclosures of the X-ray.

The essayist in his remarks stated that he had approached the chief lawyer of one of the liability insurance companies, with the thought in mind that he, if anyone, could tell him the real situation. He replied that lawsuits against dentists for malpractice had increased shockingly, and were becoming more frequent every day. Statements and statistics since received from four of the largest insurance companies indicate positively that these malpractice suits have doubled in number during the past three years, and are increasing more rapidly at the present time.

Owing to this condition, we are informed, one principal insurance company is desirous of binding the other companies to an agreement for a standard premium of twenty-five dollars for dentists' liability insurance.

The Executive Council of the State Dental Society at its 1916 meeting in Albany, after studying every phase of the liability insurance proposition, recommended that the United States Fidelity and Guaranty Co. of Baltimore, Md., be designated as the company in which to insure under a group policy any member of the State Dental Society desiring such protection. This company has $10,000,000 assets. It agrees to insure the members of this society for an annual premium of ten dollars, and undertakes to pay any judgment up to $5000 in each single case, with a limit of $15,000 for each individual member of one group for any one policy year.

This attractive proposition is worthy of the thoughtful consideration of this body. Any further information on this subject may be had from Dr. James W. Canaday, who has been appointed trustee of the policy, and from whom application blanks can be secured.

DENTISTRY IN THE WAR.

The terrible death struggle now going on in the European nations has furnished an opportunity of demonstrating to the world the importance of the great work in which we, as a branch of the healing art, are engaged. The terrible head wounds produced in the prosecution of modern trench warfare have given the oral surgeon an opportunity, with the co-operation of the general surgeon, of securing results in badly mutilated cases that seem almost incredible.

The manner in which the American Dental Corps has risen to the opportunity has excited the wonder and admiration of the entire world, and has done more than any one thing in the last fifty years to place dentistry on the high pedestal of public approbation it now occupies.

One of the beneficial results of this

awful war has been to stimulate investigation and study in oral surgery throughout the world, and its far-reaching effects will be manifested long after this struggle is at an end; and if our Preparedness League of American Dentists accomplishes no more than the inauguration of study clubs in connection with their local units for the purpose of scientific investigation along the lines indicated, its labors will not have been in vain.

STANDARDIZATION.

Those of you who have observed the signs of the times in our particular field of human endeavor will have noticed the strong effort that is being made by our foremost thinkers and investigators to eliminate the haphazard and empirical methods that have characterized our operations in the past, and to introduce methods that have been reduced to exact scientific standards.

The work of the Scientific Research Commission of the National Dental Association and its affiliated bodies in the various state societies, together with the work that is being carried on by various study clubs throughout the country, is deserving of our hearty commendation and support, and it is to be hoped that the interest that has been aroused will be fostered and maintained, to the end that the great work we have undertaken will be carried on to a successful conclusion.

STATE SOCIETY TRANSACTIONS.

At the 1916 meeting in Albany I directed the attention of the Executive Council to the fact that the Dental Society of the State of New York had not a complete set of its printed Transactions in its possession. This, to my mind, was unfortunate, as they contain a complete record of the birth and progress of our profession in this state. Your Executive Council on motion appointed Dr. Hert and myself a committee with power to procure for the State Society a complete set of its proceedings. We are pleased to report that, through the generosity of Dr. Charles S. Butler, for many years actively associated with this society in various official capacities, we are able to present to this society a complete set of its own Transactions.

I would respectfully recommend that this society tender Dr. Butler, through its secretary, its sincere thanks for this valuable gift.

I would also recommend that these volumes be placed in the State Library at Albany, in order that the members of this society may use them as a reference when desired.

I would further recommend that a committee of one be appointed from the Third district, whose duty it shall be to have subsequent numbers of the State Society Transactions bound in suitable form and deposited in the State Library at Albany, in order that the records of this society may be maintained in complete form.

In conclusion, I wish to thank those who have contributed to the success of this meeting. The unselfish interest manifested by the profession, especially the men of Rochester and particularly Dr. Link, in assuming the burden of organizing and arranging this meeting, has contributed in no small degree to the success of the forty-ninth annual meeting of the Dental Society of the State of New York.

To the essayists and clinicians, especially those from other states, who have contributed to the success of this meeting, I wish to tender the sincere thanks of our society. This sacrifice of time and money in the interest of the profession is one of the encouraging signs of the times, and speaks volumes for the success of our great work in behalf of suffering humanity.

The President's Address was referred to a committee which was instructed to report to the Executive Council.

President Murray then resumed the chair.

The President read a telegram from the Northern Ohio Dental Association, sending greetings to the New York Society, and inviting the members to meet with them on June 7, 8, and 9, at the Hotel Statler, Cleveland, Ohio.

Report of the Clinic Committee.

Dr. W. W. Smith, Rochester. Uncle Sam has been making demands upon us, and rightly so; members of the dental profession have been responding to these demands, and justly so. I am proud of the fact that dentistry has men of ability who stand ready to serve their country, but this has made great inroads upon our program, and it has necessitated a number of changes, especially in the clinics.

First, the program provides for a number of surgical clinics by some of our best oral surgeons, but we have received a number of communications, both by wire and letter, saying it would be impossible for them to give these clinics. Patients had been secured and were in readiness, and we have some very interesting cases, but it became necessary, on account of the fact that the surgical pavilion at the new dispensary was not available, to go to other hospitals, and we could not make the arrangements in time. We regret this very much.

In regard to the progressive lecture clinics, the program provided for these being held in the balcony, and large booths were to be prepared for this purpose. Conditions have arisen making it necessary to change this plan, and they will be held in another room, and instead of the audience moving from one booth to the other, the clinicians will move.

President Murray then made a number of announcements in reference to the program, after which the meeting adjourned to 2 o'clock.

Thursday—*Afternoon Session.*

The meeting was called to order by President Murray at 2.45 o'clock.

Dr. F. B. Moorehead, Chicago, Ill., gave an illustrated lecture on the subject of "The Responsibility of the Dentist in the Management of Focal Infections."*

Dr. Weston A. Price of Cleveland, Ohio, then addressed the society on the subject of "Some Studies on the Relation of Mouth Infections to Localized and Systemic Diseases."*

The society then adjourned until Friday morning at 10 o'clock.

Friday—*Morning Session.*

The meeting was called to order at 10.45 A.M., by the president, Dr. Murray.

The President. The Correspondent, in his annual report, has taken up the question of "Radiography as an Adjunct in the Practice of Dentistry," and in the prosecution of this work he has propounded a certain number of questions which he has sent to the foremost minds in the profession throughout the country. The answers he has classified, and his report I feel will be an intensely interesting one at this time.

Dr. Leuman M. Waugh, New York City, then presented the Report of the Correspondent.

[This report is printed in full at page 1105 of the present issue of the Cosmos.]

DISCUSSION.

Dr. Charles F. Ash, New York City. There seems to be no loophole for anybody to crawl through in evading the responsibility of the radiographic outfit, after the mass of evidence in its favor placed before the profession. It is only a question as to how and when it should be used, in my opinion, and the question as to its desirability is not open for discussion.

"Do you consider radiographs as being essential to best practice—taking dentistry as a whole?" I do not think *that* question is open for discussion. My answer is also absolutely "Yes" to the next question—"Do you find that quite a number of a single case are often necessary, both for diagnosis and as a guide during the progress of treatment?"

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* These two lectures were given extemporaneously, and are not published for the reason that the revised stenographic reports have not been received from the authors.—Ed.

The next question is, "In the light of your present knowledge of their value, would you feel that you could be honest to yourself or your patient without the use of radiographs?" I wonder how many men not using the radiograph in their offices put that question to themselves daily. I suppose every time a man fills a root he wonders whether it is filled to the end. It is not possible for a man to give honest work to his patients without checking it up by the aid of the radiograph. We know that many practitioners have used the same technique more or less that we do now, and in spite of their knowledge of technique and their carefulness they frequently failed to perform a satisfactory operation. If that was true then, it is just as true now.

"Do you regard the technique as so simple that any practitioner may easily master it?" An office girl can be taught to do a large part of the dental technique.

The Correspondent then asks, "Do you think it may be established in any dental office, and that it does not interfere with the ordinary dental procedure?" That cannot be answered in the affirmative in all cases. It does interfere, but I do not like the word "interfere," because it is part of the necessary operation, and I do not consider it an interference to do any part of the work that is necessary as a step toward the finished operation. I think the time taken is fully compensated for by the results.

"Do you think that all parts of the work, except placing the tube and film, can be done equally well by any average assistant?" With the modern equipment, which makes it possible for us to determine the exact amount of ampèrage and milliampèrage, and the exact amount of spark gap in penetration, it is possible for any assistant to make the exposure in a given time. There is a large responsibility on the shoulders of the dentist in being sure that his apparatus is in proper condition every time before the exposure is made.

"Do you think that a special knowledge of photographic procedures is necessary?" Anybody can learn to take a picture with the radiographic apparatus, bearing in mind that the responsibility is upon the dentist to see that his apparatus is in proper condition before the picture is taken.

"Do you think that the health of operator and patient is endangered by the use of the modern apparatus?" In view of the fact that some people have met with accidents, and that unfortunate occurrences have taken place in the offices of men who have been well equipped with a knowledge of the X-ray apparatus, I think it behooves everyone to take every possible precaution against accident. I do not believe it is well to regard too lightly the question of there being absolutely no danger in these things. It is true that a man may make radiographs day after day and have no trouble; but cases do occur where there are X-ray burns, and because there *can* be trouble it is the duty of the dentist to take every possible precaution.

There is one thing to which not much attention has been paid, but which we must learn something about. I believe every man who owns an X-ray apparatus and operates it should be able to determine the amount of penetration being given by a tube. There should be a standard penetration, a standard amount of ampèrage, a standard amount of milliampèrage, a standard distance of spark gap, and these things should be regulated within limits of a small variation between the maximum and minimum for each picture, and no picture should be taken until they are so regulated. By following a comparatively simple formula, anyone can determine the amount being given by his apparatus, and can standardize it.

Another factor is the distance between the patient and the apparatus. It can be determined exactly how many exposures can be given without risk. I think we can learn more about that; it is not a very difficult thing to do, and it ought to be done as a matter of safety. I want to emphasize that point, because I do not think there has been enough emphasis given it.

"Have you reached the conclusion that the dental practitioner can make radiographs that best meet his needs, because of his intimate knowledge of individual conditions, and of the requirements of the case in hand?" There is no doubt in my mind that the dentist himself can know better than anyone else what he wants. He wants the position in which he can see the roots without having them overlap, and he can determine that better than a man who does not know the position of the roots.

"Have you reached the conclusion that the principles of interpretation, as understood up to the present, are not difficult of comprehension?" If you emphasize the word "principles" I should say "Yes;" but if you omit the word principles and say "The matter of interpretation is not difficult," I would take exception to that. I think it requires a large experience in order to intelligently interpret radiographs. I have seen many men who have had little experience with the radiographic outfit take a picture and make a diagnosis when their experience was so limited that they were making a false diagnosis and did not know it; because they saw this or that in the picture they thought it was a definite thing on which to make a diagnosis. We are apt to jump to the conclusion that the intelligent interpretation of radiographs is rather easy.

I do not believe any man is in position to make intelligent interpretations of radiographs, or to learn to make them, unless he is taking his own pictures. I do not believe any man can learn to make intelligent diagnoses unless he takes the pictures himself. A picture is handed you from someone else with the remark, "Doctor, what do you think about this?" You may guess at it, but unless you know the history of the case and have been acquainted with the facts, you are not in position to make an intelligent diagnosis.

"Do you sometimes find conditions of a physical nature—as malformed or excessively tortuous roots, etc.—that make treatment inadvisable?" I answered this "No" when the Correspondent sent me the report, because I believe, with the requisite amount of patience and skill in following the technique given us by our very competent operators, almost any case, no matter how difficult it may look in the radiograph, may well be attempted by the operator.

Dr. F. W. Low, Buffalo. How about the pulp at the end of the root?

Dr. Ash. I have some pictures which I think would answer that question, where the multiple foramina are very well filled. The most interesting work of that kind has been done by Dr. John Callahan of Cincinnati. He has all the material to show you those things, and he has the specimens. He filled teeth and then took them out so you would be able to see them! In regard to those tortuous roots, sometimes a case in which the picture looks as though you were going to have a great deal of difficulty will be found to be simple when you open the tooth. I mean especially where you are devitalizing a tooth. Where you find crooked roots that someone else has attempted to fill, and in the attempt the operator has gone down a distance in the canal and made a square seat, and from that point on you have a curve—those are the difficult cases; because when there is a square seat in the bottom of the canal it is difficult to find the opening. Where such a tooth has not been filled by someone else, sometimes you can get your wires right down to the apex as easily as if it were a straight-rooted tooth.

"What is the minimum number of radiographs that should be taken of each case?" Speaking exactly, I could say the minimum number is one. If an operator wants to take a chance on his work being correctly done in opening the canal to the apex, and go ahead without taking an X-ray, very well, let him do so; but let him check it up at the end to see that he has reached the apex. I prefer, however, in my practice, when I think I have reached the apex and would like to know that the wire is at the apex, to insert a gold wire and take a picture, because I like to know the wire is absolutely clear to the apex before I insert the filling.

"At what stages of the treatment should these be made?" When making two pictures, I think the first picture should be taken when you think you have reached the apex, and the other when you think you have filled the tooth. If you want to take three, and use one for a preliminary diagnosis, well and good. When there are diseased teeth in the mouth, any man who is making a comprehensive diagnosis finds it necessary to have a radiograph, as this should be done as carefully and with as much detail as when the intelligent physician diagnoses a systemic condition. All the doubtful areas should be radiographed, and study models of the mouth made, in order to say intelligently what is the best for the patient's welfare.

"What is the maximum number you have made of a single case?" Someone said forty. I would not care to take forty pictures of any one part of a patient's anatomy, unless there was a considerable interval between the pictures.

As to the further questions:

> Do you consider it necessary to make radiographs in doubtful cases at intervals after the canals appear to have been well filled?
>
> Do you make a separate charge for each radiograph? If so, does the patient not sometimes question the need for several of a given case?
>
> If not in your practice, do you believe that this would be so in the great majority of practices?
>
> Would this not be overcome by having it understood that the necessary radiographs are a part of the service, and as such are not charged for separately, but are included in the general fee?
>
> Do you find that the time saved by radiodontic findings largely compensates for the time required in making them?

These are questions which each man must answer according to his own practice. If we make our patients understand that we are making the pictures because we want to give them the best and most intelligent service—if they are people who appreciate intelligent service they will be glad to have us make as many radiographs as are necessary to prosecute the case with the greatest efficiency; and if they are people who do not appreciate it, we had better let someone else do the work, or better still, train those people to a better appreciation of proper dental services.

Dr. W. Ray Montgomery, Buffalo. The viewpoint from which I shall discuss this report is that of the general practitioner who has used the X-ray in his own office for eighteen months, making the exposures himself but turning over the rest of the work to an assistant.

It has been of interest to compare this report with that of Dr. F. B. Prentiss, who as Correspondent of this society in 1913 made a report on the same subject. At that time the conclusions drawn were that, although it might be a practical proposition for the dentist to instal his own equipment and to do his own radiography, it was by no means essential that he do so.

From the present report we see that there has been a great change of heart by a great many men in the rank and file; that it is not only considered to be practical but also essential that the X-ray be used extensively in order to obtain the best results in dentistry.

What are the factors at work bringing about this great change in the attitude of the profession?

One, no doubt, is the work of Raper, who has presented to us in compact form all the theory, technique, and principles of interpretation necessary to the mastery of the subject. Another is the insistence of the medical profession on the elimination of foci of infection from the region of the mouth. Another factor is the aid which the dentist finds that he receives in his work from even a limited use of radiograms. But the determining factor, it seems to me, is the recent simplification of the apparatus.

In his discussion of the report of four years ago, Dr. Geo. M. McKee gave the following equipment outfit as the simplest from which satisfactory results could be obtained: A Ruhmkorff coil with electrolytic interrupter, a suitable radiographic chair or table, a tube stand with protecting shield, a protecting booth for the operator, and a good dark-room. This outfit required either a very large operating room or a separate X-ray room altogether, which made it impracticable for a great many men. Now we have all the necessary equipment in such compact form that it may be used in the smallest operating room, which brings it within the reach of everyone. For this result our Correspondent is largely responsible, for it was due to his efforts that such a unit was produced.

It is universally conceded that radiography is of great value in dental diagnosis. The only question seems to be as to the best method of employing it. No doubt there are a considerable number of men who would never take the trouble to master the simple details of technique. To these, the X-ray laboratory, with the interpretation given by the specialist, is open. This method served to enlighten and convince me that the apparatus was a necessary part of my equipment so that pictures might be developed and returned to me during the sitting; that often pictures are required in such numbers and at different intervals as to prohibit sending the patient out for the service. After eighteen months' constant use, after all the novelty has worn off, and it has become just one more detail in practice, I feel as dependent upon it for all operations and conditions which are out of sight as I do upon the mouth-mirror for oral examinations, and know that the best service is dependent upon it.

One of the reasons why each dentist should either do his own X-ray work or have it done under his direct supervision is that a picture taken at one angle only is seldom to be depended upon, and others are necessary. In the case of a first bicuspid, a picture taken at one angle will show but one root and one root-canal, while a slight difference in the angle will perhaps show two widely diverging roots. One angle will show a crown dowel running up the center of a root, and another may show that same dowel protruding through a puncture in the side of the root.

Another reason why it is desirable for one to make his own pictures is that although the principles of interpretation are simple, often the application of these principles is difficult, and the experience gained by studying each radiograph with full knowledge of all the conditions under which it was made will aid greatly in developing one's ability and judgment. It is highly important that one form the habit of seeing all there is to be seen on a film. It is very easy to look for the one thing you are studying and see nothing else. Often there are other conditions revealed of even greater importance.

Particular mention has been made in the report of the application of the radiograph to root-canal treatment; there is another application upon which I wish to lay special emphasis. It is the desirability of obtaining pictures of all roots upon which crowns or bridges are to be mounted, particularly those which have been treated by someone else, and of whose history you know nothing. With the present available facilities, one is most negligent who will place extensive bridge work or abutments that have not been studied by the aid of the X-ray.

Modern apparatus used intelligently is apparently free from danger to both patient and operator. Reasonable caution and common sense should, however, be observed. Some persons seem to have an idiosyncrasy to the ray, and receive effects from an exposure which would in no way affect others. I have recently seen two cases where head pictures had been made by a competent specialist. In one, the hair had come off the entire side of the head; in the other, from just back of the crown of the head, the hair had come out, leaving a round bald spot four inches in diameter. There was no sign of dermatitis in either case. The hair will undoubtedly grow again, but it creates an embarrassing situation. Of course, for the head picture a much greater exposure is required than for a dental film held in the mouth.

From the beginning it has been my policy to include the radiographic work as part of the service, and not make the fee dependent upon the number of radiograms made. This removes any cause patients may have for suspicion when several exposures are necessary, and serves to convince them that an endeavor is being made to be thorough. It has proved itself to be a comfortable working system.

The Correspondent should be complimented on the very comprehensive list of questions submitted, and the very large number of replies should not only be a source of gratification to him, but also an indication of the very widespread interest which has developed in this very important subject.

Dr. R. Ottolengui, New York City. I will not waste time by saying how pleased I was with Dr. Waugh's report and with the previous discussion. The question is, "Shall we have this work done by an outside specialist, or shall we do it ourselves?" I can speak from the experience of having had it done in both ways. I began by having my patients go outside. Immediately you do that, you necessarily emphasize in the patient's mind the idea of cost. A man knows very well, when he travels from your office to another man, that that man must be paid for every visit.

I have seen recently a rather peculiar and novel arrangement in one of the new office buildings in Chicago. A large portion of the building is devoted to from ten to fifteen dental offices with a common entrance hall, a common waiting room, and a maid to take messages to the different dentists. In some of the suites there are men who do only radiographic work for the others, but even that is not satisfactory, because after all, what we want is interpretation, and the only way to acquire the ability to interpret radiographs is to take them yourself and learn the angle, the penetration, and the meanings of the shadows, because *shadows* are all that these pictures really are.

I am more than delighted to hear, in the Report of the Correspondent, my highly esteemed *confrère* using the word radiodontia. There is a question in some minds as to whether or not dentistry is a specialty in medicine, but radiodontia is less related to general radiology than dentistry is to medicine.

It has been said here tonight that no special knowledge of photography or knowledge of films is necessary. I have been doing photographic work for about twenty-five years, and it seemed a very simple thing for me to go ahead and take up this X-ray work and develop my own films; and yet last fall, when I came home, it was with much chagrin that I found I could not make good radiographs. Not believing, of course, that it was my own fault, I thought the blame lay in my apparatus, and did all kinds of things to that poor radiographic outfit. I had experts come and examine the tubes—one man was so expert that I had to pay another man to undo what he had done!

Then Dr. VanWoert said, "Maybe your developer is wrong." I said it was impossible. Then it occurred to me to test it. I radiographed a case, developed one of the films in the developer that I had been using for a year, and another film with one of the Eastman developing powders, and they were so unlike that you could scarcely believe it was the same process. So sometimes the fault is in the developer. Knowledge of the developing process is therefore advantageous.

A great many methods of holding films have been devised, and it is curious that dentists have not thought of a film-holder so simple as a bicuspid or molar clamp, one end going on the tooth and the other on the film.

In regard to the number of films, it seems to me almost impossible to get along with less than two—I prefer three—because I would rather know the direction in which I might cause difficulty than to cause trouble and find it out afterward,; and that of course brings us to the cost.

One of the questions is, "Do you charge for each film?" I would rather put the question this way, "Do you charge for radiographing each tooth?" because in my opinion, if I am satisfied with one angle, that is my radiographic record; but if I need two or three, my fee would be the same. Whether I take one, two, or three, the fee to the patient is the same.

In regard to objections, I have none on the ground of expense. The objections are from fear—where the patient has heard of the danger, and is afraid. Those are nervous patients, and they must be satisfied.

With regard to multiple foramina at the apex, it remains to be proved that any real pulp tissue passes out of more than one or two foramina close to the end of the root. I have seen cases where the clinical picture seems to indicate that the pulp tissue occupies those foramina. Just so long as the external orifices of the multiple foramina are covered with healthy pericementum, forget it—don't worry about it; but when it is absolutely uncovered, the probability is that you cannot save the tooth unless you resort to amputation.

Occasionally some of these multiple foramina are quite large, and where they are, we seem to be able to cleanse them chemically with the sodium and potassium treatment. Many of those canals which do not appear before they are filled become exceedingly apparent when they are filled.

Dr. John R. Callahan, Cincinnati, Ohio. In the first place I owe you an apology, and also the gentleman who sent out the list of questions. I did not see the questions until after the second of May, which was the day on which he wanted them back in his hands.

As to the X-ray, there are so many sides to that question that it would not be wise to attempt to discuss it as a whole at this time. So far as the man outside of the office taking the radiographs, I agree with all that has been said. I have in mind the case of a physician who had a skin eruption that was giving him a great deal of trouble. He went to an X-ray specialist and had a number of radiographs taken, and his mouth was pronounced to be in an absolutely healthy condition. He brought the radiographs to me one day, and after looking them over I said, "The pictures look all right. I see nothing from those pictures, but I would like to examine your mouth, as is my custom, and not depend entirely on the picture." First I illuminated the mouth. I like to go about it in the old-fashioned way, and I found a central incisor that looked a bit cloudy. There was no external indication; it was just one of those dead colors. On further examination I found no response to the electric current, and the patient was astonished when I said I wanted to open into that tooth. It was filled with pus—one of the foulest teeth of which I have had experience. The X-ray did not show that, as it does not show pus within the canal. If there is a rarefied area, it shows that. We must take these things into consideration.

As to the matter of fees, I think it is a great mistake to discuss fees at all with the patient if you can avoid it, and you can so train your patients that very little will be said about them. I have been in practice many years, and very seldom is there anything said about fees, because it is known in my community that if there is any objection to the fee, that patient's name is erased from my list.

In regard to placing wires in teeth, I beg all of you to be a bit careful in pushing wires down into the teeth. It should be done only under certain conditions, and never in the preparatory treatment, as it is quite impossible to pass a wire through a root-canal without forcing something out at the foramen, whether you find that foramen or not. In one of my experiments I took 220 small glass tubes, mounted a tooth in one end of each tube, filled the root-canals with various substances, and tried to pass wires through the canals; and those substances in the canals would make their mark at the apical foramen.

The canal should be opened and freed from septic conditions as nearly as possible, in order to avoid carrying infectious matter through the root.

As to the multiple foramina, I shall only say now that there *are* roots with multiple foramina, they do contain tissue of some sort, this tissue does become infected, and should be removed and the canal filled—and those canals *are* filled. Those men in New York who have been doing such glorious work in that line for a number of years do fill those canals. I have seen them, and have seen many of my own that I did not fill—because I have taken the teeth out, cut them into specimens, and examined them.

Dr. Waugh (closing the discussion). I have succeeded admirably in doing what I had hoped. I made out a list of twenty-five questions in such a manner that any practitioner might, with a minimum expenditure of time, answer them. A correspondent, in formulating his questions, does so with the hope that they will be answered as he desires, and I formulated my questions so that "No" was the desired answer, but that "Yes" might be given. I felt it would stimulate considerable discussion, and in that respect my ambition has been gratified. I feel that we are honored by having the paper discussed by some of the eminent gentlemen who have done so much to show us the value of the radiograph in practice.

When anything new comes to us, it is immediately grasped as a panacea for all things, and so the radiograph has been grasped by many men, not by the dentist only, as showing positively the Yes and No—as settling for all time the question that is in the balance. I want to remind you that a radiograph is merely the permanent registration of a shadow. It is not focused, and shows no perspective, as does a photograph. It does not magnify. I have seen interpretations made not by radiodontists, but by X-ray specialists, in which they venture to tell what kind of bacteria are present at the root-end. I heard one of my good friends say, "I examine every radiograph with a magnifying glass; then I can tell if there are bacteria at the end of the root." How can you see bacteria with a magnifying glass, when a radiograph does not show bacteria?

Let us get down to a sensible basis as to what the radiograph will do.

It is a record of a shadow. It will not show disease or the presence of a lesion; it will show evidence of some lesion existing, or having existed. You cannot even tell whether or not that lesion is present, therefore clinical history, as I tried to bring out, is of essential importance in reaching an intelligent decision in diagnosis. Even with all these limitations, we must have it; so let us be sensible about it. Frequently one picture of a given case will contradict another. Many of you have brought radiographs to me and asked my opinion, and I have said, "I cannot tell; I would like to see another radiograph." I suppose many of you thought I was trying to dodge the issue, but that was not the case. It is often necessary to have several radiographs at different angles to be able to judge the conditions intelligently.

A radiograph has areas of different lightness and darkness. As I said in the clinic, and I will repeat it here, the areas that least resist the passage of the X-ray will give dark shadows, and the relative densities are all that is shown in the shadow.

With regard to the danger of using the X-ray outfit, within the last two years and seven months I have personally made 4500 exposures. I value my health as much as any of you. I was a boy in my father's dental office in the city of Rochester, and I knew of men doing this work who lost, one an arm and one a finger and one another part of the body. While I was attracted to this work, I felt I would rather save my life and use it for something more useful. So that I did considerable experimental work with radiography in the beginning. With these 4500 exposures I have used just common-sense methods. Of course you should not expose yourself unnecessarily. I have a friend in this room who has made a great number of exposures, and who is in perfect health, and is raising a nice family.

Much has been said by one of our teachers, a physician who does excellent general radiology, about the dosage. I have made hundreds of pictures for patients, making from twelve to twenty exposures at one sitting, radiographing sometimes the whole mouth, sometimes only suspected areas or difficult areas, and in all that number there was not one instance reported where the X-ray even reddened the surface of the skin. I have had patients come to me and say, "I was sent to you as a specialist. I have had work done before, but my eyebrow was burned off, or my hair came out, and I would not care to have it happen again. If you can guarantee to do radiographic work without adverse results, I will have you do it for me." I said, "I have made about 3500 exposures, and have not even irritated the skin. The ray will not strike the eyebrows or the hair. If you want me to go ahead with that idea—I cannot make any further guaranties—I will do so."

It is not necessary for Dr. Ash—and he and I agree in the main—to say how many exposures shall be made, and what the penetration of tube shall be, or how many milliampères shall be in the tube, unless he refers more particularly to the length of the exposure. If you make an exposure of twenty-five seconds you have given a longer exposure than I would give in making ten radiographs. A continuous exposure of twenty-five seconds gives the patient a great deal more dosage than ten short exposures would with an interval between each exposure. We must think of the length of time of exposures as well as the number. We must differentiate a little more definitely.

I have made ten to twenty exposures within a single hour, and have not irritated the skin—no eyebrows dropping off or hair coming out—and I know of many men who have done the same. We hear of one of our radiographers having a finger taken off. I have talked with men who were injured, and they feel that the results were caused by the ignorance or carelessness of years past.

I think the sad part is, and the consensus of opinion bears this out, that when it becomes sufficiently evident there is rarely any cure for it—there is a cancerous tendency.

In reference to what Dr. Ottolengui said about his fingers, you do not have to expose your fingers at all. Use rubber gloves or a little clamp.

The principles as we understand them today we will know differently tomorrow, and again differently the next day. The radiographer is able to interpret things that he could not interpret five years ago. As Dr. Montgomery said, you cannot intelligently interpret the films until you do the radiographic work yourself.

You have the specialist in radiodontia. You can employ him. It does not mean you must form your own opinion alone. Show your radiograph to your neighbor, and your knowledge will grow, and each dentist will acquire a knowledge that will enable him to more accurately make a proper diagnosis. You do not need to know it all at once.

When I spoke of tortuous roots in one of my questions I thought of a nose-and-throat specialist who came into the First District Society with a handful of teeth, and said, "Look at these teeth—curved roots—fused roots—who could fill them? I have had to take out thousands of tonsils on account of your neglect. It is useless to even attempt to treat such teeth."

I want to make a distinction between the vital tooth and one in which there is periapical disturbance. If you take out a pulp, it is advisable to make two radiographs, one at the beginning of the filling operation with the wire in position, and one when the operation is completed; but where there is infection beyond the root-end, I think it is desirable to make three. If you are going to make only one, I think it should be made when the wire shows clear to the root-end.

Dr. Ottolengui spoke of the rubber-dam clamp for a film-holder. I have a little clamp arrangement—some of you have seen it—in which there is a ball-and-socket arrangement. This is soldered to a molar clamp, and attached to it is a little holder into which the film slides. It is not so simple as Dr. VanWoert's, but I should like you to see it.

As to the development of the film, I, like Dr. Ottolengui, had a hobby for photography. I was opposed to the idea of tank development. I thought it was absurd to turn the films into a tank and develop them in that way, and I think yet one can get better results with separate development. With experience you can do it better, and get a little more out of the negative; when developing, you can hold it to the light, and see little shadows come into it. Soft tissue will show in a negative when partly developed or lightly developed that will disappear when the same film is allowed to remain in the developer a little longer. You can get those shadows, and obtain a more intelligent idea by doing the developing yourself.

If this report has only interested you for the time being, I will feel my time has not been wasted. If these discussions do not impress you and convince you of the value of the X-ray so that you will decide to put some sort of radiographic equipment into your office, I shall feel that my effort has been more or less a failure. I was somewhat reticent about taking up this subject, feeling that all this was obvious, and must be known to everyone. Before sending out these questions, I sent a list of five questions to the president and secretary of each district in the state, and the answers I received impelled me to pursue the subject farther.

Those questions were, in effect:

(1) How many use radiographs generously, and have them made?

(2) How many use them sparingly?

(3) How many men in your district have apparatus?

(4) How many men have you in your district?

(5) Give me the names?

I hope those of you who have not been doing your own radiographic work will now go home and do the work yourselves.

Dr. L. A. Timerman, Fort Plain. We have a little matter out of the ordinary to present, and I ask Dr. H. L. Wheeler, who cannot be here later, to explain it to you.

Dr. H. L. Wheeler, New York City. Dr. Timerman has had the good sense and good fortune to suggest that this society furnish to the Government a traveling dental office, to be sent to the front, or wherever the Government may need it. As I have been on the other side within the year, and have seen some of these in operation, I consented to speak to you on the subject. They are using in France—both in the English and French armies—an automobile with a portable chair and dental equipment, and a small laboratory for vulcanizing and doing mechanical work of various kinds, manned by a dentist and a laboratory man. In my opinion, it is the duty of every dentist in the country to make a list of all the available good laboratory men that the Government may have. It has been found necessary in Europe to mobilize the mechanical men, in order to give the necessary assistance to dentists who attend to the absolute needs of the soldiers in the trenches and the base hospitals. A traveling dental office at the front is necessary. No matter how good the condition of the mouth may be when the soldier goes to the front, the extreme privations he is subject to in the trenches and in battle bring dental troubles in sufficient quantity to keep the dentists busy in alleviating pain and distress. These dentists have the opportunity by being at the front to assist in keeping men in better condition than they would otherwise be if they did not have immediate relief from dental troubles.

I appeal to you to try to raise the money for not one only, but more if possible. I am going to Washington tonight, and shall see the Surgeon-general tomorrow, and it will give me great pleasure to tell him that we are interested in it, and will try to help in this way. You cannot all go to the front, and cannot all help to put the mouths of recruits in condition, but in this way you can do your bit, and get your patients to assist you.

I have been asked to give an idea of the cost of such a traveling dental office. I think that the Ford chassis is one of the best that can be used, because the heavier chassis gets stuck in the muddy fields and bad roads, and while a few men can jack up a Ford chassis so it can go ahead, they cannot handle the heavier ones so well. The whole thing should cost in the vicinity of from $2000 to $3000—probably with the Ford chassis it might be less. One generous man I know has offered to equip one, and pay for the driver throughout the war; but he being a man who likes to see things well done, and not consulting us, has already purchased a Pierce-Arrow chassis.

The equipment not only must be considered, but the cost of the upkeep. I am quite sure the Government will furnish the dentist and the laboratory assistant. Duplicate parts should be purchased at the time the original equipment is purchased, and there must be a chauffeur who is fairly well equipped to do the work. The ambulance drivers are put through a three months' course before they go to the front, and must show their ability to take the machines apart and put them together before they go out for active service. You must have a driver who is mechanically competent.

The meeting then adjourned to 2 P.M.

(To be continued.)

Susquehanna Dental Association of Pennsylvania.

Proceedings of the Fifty-fourth Annual Meeting, held at Allentown, Pa., May 22, 23, and 24, 1917.

(Continued from page 1023.)

WEDNESDAY—*Afternoon Session.*

The meeting was called to order by the president at 2.40 P.M.

The President read a telegram from Dr. H. M. Beck of Wilkes-Barre, announcing the death of Dr. William M. Wright of that city.

Dr. SEIP moved that a committee be appointed to draw up resolutions on the death of Dr. Wright and the other members of the association who had died during the year. (Motion seconded and carried.)

The President appointed on this committee Drs. D. B. Williams of Wilkes-Barre, E. J. Donnegan of Scranton, and W. C. Middaugh of Easton.

The Secretary read the resolutions presented by Dr. VanHorn at the last session proposing an amendment to the By-laws with regard to membership in the society, as follows:

Whereas, the Susquehanna Dental Association of Pennsylvania is the oldest association in the state devoted to dental art, science, and literature; and

Whereas, the Susquehanna Dental Association of Pennsylvania, by virtue of the territory it embraces, is not directly affiliated with any other dental organization; and

Whereas, the purpose of the Susquehanna Dental Association of Pennsylvania is to advance all branches of dentistry, promote ethics, encourage good-fellowship, and stimulate dental activity generally; therefore, be it

RESOLVED, That all applicants for active membership in the Susquehanna Dental Association of Pennsylvania must be active members, in good standing, in the Pennsylvania State Dental Society; and be it further

RESOLVED, That within three years after the adoption of this resolution, all active members of the Susquehanna Dental Association of Pennsylvania must become members of the Pennsylvania State Dental Society.

Any active member who, after being duly notified by the secretary, shall fail to comply with this resolution, shall be held suspended without action by this association.

Respectfully submitted,

C. S. VanHorn, Bloomsburg.
H. S. Seip, Allentown.
V. S. Jones, Bethlehem.
W. C. Scott, Lansford.

Dr. H. S. Seip moved that the foregoing resolutions be adopted as part of the Constitution and By-laws.

The motion was seconded and carried.

Dr. Judson Daland of Philadelphia, was then introduced by the President, and read a paper entitled "Dental Abscess or Infection and Its Consequences."

[This paper is printed in full at page 1098 of the present issue of the Cosmos.]

DISCUSSION.

Dr. Arthur H. Merritt, New York City. I should like to compliment Dr. Daland on his excellent paper. There are two points he has made, however, that may be open to criticism. One is the question of complete X-ray examination of the teeth when secondary infection is suspected as possibly proceeding from the mouth. It has been my custom, having an X-ray outfit and having been a student of radiography for years, to take pictures of these cases; and it has been my experience, as the result of having made several thousand X-rays, never to have found an infection on the apex of the root of a vital tooth. Therefore I think sending all patients, particularly those who have to consider the expense, to the roentgenologist is unnecessary. It is not uncommon for the physician to say, "Go and have your teeth radiographed," which is done, and which costs a great deal in many places. In New York the charge is fifty dollars to have this done by our best roentgenologists. These plates are brought to the family physician, who, as a rule, is not qualified to interpret them, and on the strength of these X-ray findings the patient is sent to the dentist, who is asked to do what he should have been asked to do in the first place, that is, to make the diagnosis. To send the patient directly to the roentgenologist is wrong. The clinical examination should precede the roentgenological. The mouth should be examined by someone, and every tooth about which there is any question of its vitality should be radiographed, but to do more is, to my mind, a mistake, particularly in the cases of people who must consider the question of expense.

The case Dr. Daland reports proves that only that particular tooth was infected. It is probable, in the light of our present knowledge and technique in the treatment of non-vital teeth, that in many of these cases in which we appear to have done good work, preceded by careful sterilization, reinfection may take place, but that it does so in all such teeth seems unlikely, and I rather question the advisability of radiographic examination as a routine measure, as suggested by Dr. Daland.

There is one other point I should like to speak of, and that is, the question of the non-recognition by the average dentist of the seriousness of these conditions. I do not know enough to speak with accuracy on this subject, but it seems to me, though it may not be true of the country at large, that the dentists I see are fairly alert on the subject. They are not apathetic. They at least recognize every tooth as a potential if not an actual danger, and are anxious to coöperate with the medical profession in every way. That there are exceptions to this there is no doubt, but that there are more in the dental profession than in any other seems to me not yet proved. It is unfortunate that dentistry was ever divorced from medicine; but let me recall to your mind that in 1837, when the dental profession asked the University of Maryland to have dentistry put in the regular medical course they were refused, with the statement that dentistry had nothing to do with general medicine. Therefore our anomalous position is not to be laid as a charge against the dental profession. We feel keenly the position we now occupy, and we appreciate the fact that we are not trained as thoroughly as we should be for the work we must do. But we are anxious to do what we can, and if we can have the co-operation of the medical profession, we shall come into our own.

Dr. Daland (closing the discussion). Each year I meet or communicate with a large number of dentists living in various parts of the United States, and know that many are interested in mouth sepsis; but careful study of their patients shows that not infrequently principles of focal infection are not applied. Physicians frequently refer patients to dentists to determine the presence or absence of focal infection, but dentists rarely refer a patient with mouth sepsis to a physician to ascertain whether or not systemic infection exists. As we know that endo-, peri-, or myocarditis, nephritis, polyarthritis, or cholecystitis are frequently due to focal infection, the importance of the prompt detection and removal of mouth sepsis cannot be exaggerated. If a septic focus be undetected a patient may suffer from recurring attacks of disease, so that ultimately so much destruction takes place that permanent disability or death follows. It is now known that many cases of so-called Bright's disease are due to recurring unrecognized attacks of septic nephritis, secondary to focal infection. Symptoms due to disease of the kidneys or heart may be absent, or so slight that they are not recognized by the patient or physician.

The importance of removal of focal infection, from the prophylactic standpoint, is very great, and not fully realized, and justifies the time and expense necessary to secure its recognition and removal.

It is regrettable but nevertheless true that a large number of prominent dental surgeons, more especially if they have been specializing in mechanical dentistry, do not appreciate the danger to which their patients are exposed when mouth sepsis exists.

The next item on the program, as announced by the President, was the reading of a paper by Dr. HENRY I. KLOPP, Allentown, entitled "The Relation of the Hospital to the Community."

[This paper is printed in full at page 1102 of the present issue of the COSMOS.]

DISCUSSION.

Dr. E. C. Kirk, Philadelphia. I should like to say that Dr. Klopp need not apologize for bringing a subject of this kind before a dental audience. I for one am very grateful to him for doing so. Why is it not our individual problem? The dentist is a specialized member of the community; but being a dentist does not absolve him from his other obligations to the community. It is not only in line with his interest as a professional man, but also as an individual, because he may have such a case in some member of his own family or one with which he is connected. Therefore I think that it is important to consider these sociological questions, in which we should all be interested, and particularly the very question I referred to this afternoon.

I wish that every state hospital would make it a part of the routine investigation, just as by making Wassermann reactions they test out the underlying substratum of syphilis that is undoubtedly a factor of the background of many mental disturbances, to radiograph the head of every child patient in order to discover dental lesions in the way of impactions and other abnormal mouth conditions. By doing so, I think they would do a large work in prevention, and would eliminate a large percentage of mental defectives by searching out and caring for those cases having a dental origin. I believe a large percentage of mental deficiency would be found to depend on such aberrations of the jaws as have been pointed out this afternoon, and every hospital for mental defectives should make it a routine procedure to secure radiographs of the head of every patient presented for treatment. If I had Dr. Klopp in my office for an hour, I think that I could convert him strongly to that point of view.

Dr. A. B. Vastine, Danville, Pa. I cannot refrain from referring to a case which I think has a bearing on the subject of the paper. I had a case, a few years ago, which I reported at the 1915 meeting of the Susquehanna Dental Association in Wilkes-Barre. The patient was a girl of fifteen years who had been a bright pupil in one of the country schools, and had suddenly become deficient, soon afterward developing a case of so-called St. Vitus' dance, which the family physician attributed to puberty and lack of proper function of the thyroid gland. I had been a physician, so that I could control the patient, whom I showed to an assistant I had in the office. We called the attending physician's attention to the child's mouth and the need of orthodontic treatment, but he said that we had better defer treatment of the mouth conditions until the other condition had subsided.

We found the state of her mouth to be as follows: She had had the first permanent molars extracted, and her remaining teeth showed a deficiency in calcium nutrition, evidenced by erosion around the gingival margins of the teeth, together with inability to hold the head up. She did not improve under medical treatment. The twitchings in the face and arms continued, and she seemed to be getting worse. I finally persuaded the parents to allow me to proceed with the treatment of the irregularity. I put an expansion arch on the teeth, and brought the arch back to normal at the end of two months. Within two weeks after the expansion arch was put on, the twitchings began to subside; and within two months, in which eight millimeters of expansion was produced, the evidences of the disease had entirely disappeared. That was a year ago, and this last school year she made the highest average of her class. Yet this child had been taken out of school on account of mental deficiency. I consider this a marked instance of impaction caused by collapse, rather than by contraction.

Dr. Klopp (closing the discussion). I heartily agree with Dr. Kirk that we should do everything possible in making our examinations to diagnose the condition. I want to state that every opportunity is given the members of the staff at our hospital, as well as the dentists who are connected with the institution, to do such work and make examinations. However, I wish I had a larger opportunity to carry on the work along the line that Dr. Kirk has outlined.

With regard to the remarks of Dr. Vastine, I dislike to say it, but the members of the medical profession are full of excuses when they do not know. If they would only be honest, and say so! Simply to say that a certain state of affairs exists because of puberty and enlarged thyroid shows ignorance. We know there are these various reflexes. I am willing to admit they may come from the mouth or any other organ of the body, and we should not be satisfied until we have investigated every part of the anatomy. If we would do that, the physician as well as the dentist would get more uniform and accurate results, to the satisfaction of both the patient and his friends.

Dr. ARTHUR H. MERRITT of New York City presented a paper on the "Rational Treatment of Pyorrhea," which was discussed by Drs. E. J. Donnegan, Scranton, R. G. Hutchinson, Jr., New York City, and Hermann Prinz, Philadelphia.

The society then adjourned until the next annual meeting.

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

EDWARD C. KIRK, D.D.S., Sc.D., LL.D.

PUBLISHED BY

THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

Subscription Price, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Virgin Islands, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the Editor, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the Business Manager of the Dental Cosmos, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, NOVEMBER 1917.

EDITORIAL DEPARTMENT

"Recognition."

In our previous issue we discussed the principle involved in the exemption of dental students from active service, and incidentally an opinion attributed to the Hon. Secretary of War, in effect that "If necessary, the army could get along without dentists"—a point of view manifestly due to lack of knowledge of the function and purpose of dental service as related to the health and efficiency of the army. That the opinion thus expressed does not reflect the views of our national legislative bodies, the medical profession, nor of the general public is practically demonstrated by the fact that when the statement quoted was made there was pending in the Senate a bill specifically recognizing in principle the importance of dental service to the health of the army *personnel* on exactly the same plane as the national Government has accorded to every other department of the medical service. During the closing hours of the 65th Congress this bill, the text of which appears in this issue [see page 1169], became law by executive approval. Briefly stated, the law provides that within the Dental Surgeons Corps there shall be ''commissioned officers of the same grade and proportionally distributed among such grades as are now or may be hereafter provided by law for the Medical Corps, who shall have the rank, pay, promotion, and allowances of officers of corresponding grades in the Medical Corps, including the right to retirement as in the case of other officers.'' The same law further provides for the relief of drafted dental students from active military duty during the time necessary to the completion of their college professional courses on the same basis as students in medicine have been likewise permitted to complete their professional training.

Taken together, these two enactments of our national Government mark an epoch in the history of dentistry. From the time of its organization as a professional activity in 1839—indeed, even before that period—those whose tastes and inclination led them to specialize in the study of the mouth and teeth had demanded recognition for their field of activity as a legitimate department of medical science and art. This demand has been persistent and continuous, and has been with equal persistence rejected and combated by the organized medical profession because from the medical point of view the dentist by reason of his special training and his special degree lacked the hall-mark of legitimacy as the practitioner of a recognized medical specialty. Medicine assumed with questionable justification that any devotee of the science and art of healing who had not pursued the accepted and conventional curriculum of training that terminated in the medical degree was *ipso facto* unqualified to practice any specialty of the healing art, nor was his judgment even with regard to his special field entitled to respectful attention by those who held the medical qualification.

The demand for recognition of the dental specialty is based upon its intrinsic importance as a department of the healing art. The fathers—the pioneers who laid the foundations of the plan which gave to dentistry its professional status—with clear insight and prophetic vision and with unswerving faith in the soundness and justice of their position were content to work out their professional salvation in the belief that time and the inherent merit of their cause would eventually bring to it the recognition to which it was in equity entitled. Progress toward the goal has been tardy, and often needlessly impeded by the human factors of personal ambition and prejudice, nevertheless the advance though slow has been sure, and the end has been inevitable from the first.

The growth of scientific knowledge by which the interrelationships of the mouth structures and teeth and the general bodily economy have been made manifest by the researches of dental and medical investigators, has served to close up and in large measure to obliterate the hiatus between dentistry and medicine. It has been discovered that dentistry comprises more than dental art and craftsmanship, just as it was discovered long ago that there is more in surgery than mere handicraft; that medical science is the basal foundation of dentistry just as it is the groundwork of surgery and the unifying factor of all of the special departments of healing. The contributions of dentistry to the science of medicine in the general sense of that term have made it an admitted department of medicine. The artificial and conventional distinction which has heretofore caused it to be regarded as a ''thing apart'' has gradually undergone disintegration until it has become a distinction in name only and no longer a distinction in fact.

That professional prejudice, the instinct of self-preservation, fanatical adherence to an ancient and hopelessly senile ideal, on the part of the medical profession, has largely delayed, though it could not prevent, the ultimate recognition of dentistry as a legitimate medical specialty is now a demonstrated fact. But the altered state of mind of society which is being wrought out by the democratizing effect of the world war has suddenly wrought the change which in normal times would have waited a generation longer for fulfilment. The service of dentistry in the conservation of health has become recognized as one of the indispensable factors in the winning of the war; and in order that dental service may become effective it has naturally followed that it must be relieved of the handicap which subserviency to superior rank in medical administration has heretofore imposed upon it in its army relationships. The Congress of the United States has therefore in its wisdom cut the Gordian knot of professional prejudice and opened the way for efficient dental service for those engaged in the defensive work of the nation. This official act of the national Congress is therefore the mark of an epoch in dentistry—the official baptism of the dental specialty as a recognized department of the science and art of healing.

The achievement of our goal is not to be regarded as one of the accidents of political activity. Its attainment was only possible because dentistry by scientific investigation had made known the causal relationships of dental and oral pathological conditions to disorders of the general health—that bodily health is in its degree dependent upon oral hygiene as it is upon sound health in other parts of the body. The demonstration has been made and official recognition accorded.

We have at other times cited the principle that every opportunity carries with it a corresponding responsibility. The application of that principle to the present case is manifest. If we are to maintain and permanently justify the recognition which has been accorded us, our achievement in scientific professional progress for the future must keep pace with—indeed, it must exceed—what it has been in the past. ''We have our 'blue china'; now we must live up to it.'' We are facing ''the next step,'' and the answer to ''Will dentistry take it?'' is yet to come.

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This work was compiled, as is clearly set forth in the preface, "for the use of those whose object is to devote their energies to practical oral hygiene work;" but apart from this the reviewer considers it a work which should be found in the library of every dental practitioner—the facts as concisely stated forming an excellent basis for more detailed study of the subject matter in the various journals and text-books.

The advisability of educating and allowing dental hygienists to carry on this work is being discussed *pro* and *con.* by the members of the dental profession throughout the various states at the present time, and promises to attract their attention for some time to come.

All states should pass laws absolutely regulating the activities of dental hygienists and prescribe penalties applicable to both dentists and hygienists who do not live up to the letter of the law.

As regards the text, the chapter on Anatomy deals with general and special dental anatomy in a clear, concise manner; the subject is presented in a way that can be readily grasped by those who have a high-school education, and contains the essentials in so far as is necessary for the requirements of the dental hygienist. The same is true of the chapter on Physiology.

Bacteriology: The bacteriologist is confronted with greater difficulties in deciding how far to go in presenting his quota for the instruction of those whose sphere of work does not demand an extensive course. Dr. Rettger was manifestly compelled to deal with the subject in the face of this difficulty. A short chapter on the pathogenic organisms encountered in oral diseases should be added, and the chapter on Sterilization and Disinfecting should be made to conform to the requirements of a dental office. The definition of disinfection is open to criticism, as this term essentially indicates the destruction of infective organisms; in some methods of disinfection all organisms are destroyed or removed; by other methods the infective organisms are removed, but not necessarily all organisms.

The chapter on Inflammation should be amplified by a presentation of the inflammation of bone and of the inflammatory reaction as it affects the soft tissues of the oral cavity.

The presentation of the subjects of Deposits and Accretions and of Dental Caries is fully adequate. The paragraphs on page 198 dealing with the hydrolysis of starch and cane sugar should be amplified and materially changed in a revision of the work.

The chapters on The Teeth as a Masticating Mechanism and on Malocclusion of the Teeth, are entirely adequate; the chapters on Pyorrhea Alveolaris and on Alveolar Abscess are concise and clear. The treatment of this condition is a phase of oral work which should be entirely in the hands of the practitioner. Dental hygienists should not be allowed to treat pyorrhea other than by aiding to clean the teeth superficially and to remove superficial concretions. They should not be allowed to work below the gum margin or have anything to do with the treatment of abscesses or cleaning and filling of root-canals.

The subject of Dental Prophylaxis is admirably dealt with. The same is true of Dr. Chittenden's chapter on the Chemistry of Food and Nutrition; he has stated facts concisely and has not elaborated them in such a manner as would lead to confusion in the minds of those for whom the work is intended.

The article on Dermatology is excellent. It will enable the hygienist to search for and determine the existence of skin diseases, but the dental practitioner should refer all such cases to a physician and not attempt to diagnose or treat them. Dermatologists very frequently are puzzled in making differential diagnoses of skin diseases, and consequently find it necessary to seek various aids before being able to correctly diagnose the existent condition. This work requires years of special training, which fact some do not realize. Dentists in this respect should realize that a little knowledge is a dangerous thing, and a particularly dangerous thing as applied to special diagnosis outside the dental field.

The chapter on the various phases of Hygiene, pages 429–504, is quite complete as regards its value in the education of the dental hygienist. (The reviewer cannot refrain from taking exception to the term "bad hygiene" in the paragraph on page 429; it is a misnomer.)

Dentists and physicians will do well to place a copy of this work in the hands of their office assistants, and every medical inspector of schools should possess a copy. It is a most important book and its influence for good should be far-reaching.

N. G.

Books Received.

Books received are acknowledged in this column, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

"A Manual of Anatomy." By Henry E. Radasch, M.Sc., M.D., Assistant Professor of Histology and Embryology in the Jefferson Medical College, Philadelphia. Octavo of 489 pages with 329 illustrations. Cloth, $3.50 net. Philadelphia and London: W. B. Saunders Co., 1917.

"Applied Anatomy and Oral Surgery for Dental Students." By Robert H. Ivy, M.D., D.D.S., Assistant Surgeon, University of Pennsylvania Hospital; former Instructor in Oral Surgery, University of Pennsylvania. Second edition, thoroughly revised. Pp. 290, 12mo, illustrated. Cloth, $1.75 net. Philadelphia and London: W. B. Saunders Co., 1917.

Review of Current Dental Literature

[*The Lancet*, London, August 4, 1917.]

The Parasitology of Pyorrhea Alveolaris.

EDITORIAL.

In recent years the clinical effects which are supposed to result from pyorrhea alveolaris and the causation and treatment of the disease have received a good deal of attention and been the subject of much experimental investigation. The difficulty has been to distinguish among the crowd of micro-organisms present in the pus from the alveolar pockets those which were primarily responsible for the lesions and those which were merely secondary infections. These latter, however, may be, and probably are, of great importance in the causation of symptoms. Attention has been drawn to the almost constant presence of amœbæ in the pus, and the disease has been attributed to their action, but on the whole the balance of opinion is against the view that they are the cause of pyorrhea. It is true that amœbæ are nearly invariably to be found, but there does not appear to be any connection between the severity of the disease and the number of amœbæ, nor has inoculation of the purified organism in animals or in the tooth sockets of the experimenters themselves produced any characteristic lesions. With this conclusion Dr. Aubrey H. Drew and Dr. Una D. Griffin, in the April number of the *Journal of the Royal Microscopical Society*, appear to agree. Taking advantage of the large amount of material passing through their hands at the dental hospital, they have investigated very fully the parasitology of pyorrhea, and have described some interesting phases in the life cycle of the amœba and discovered what they believe to be new species of flagellates. In conjunction with Dr. Penfold they attempted, though without success, to obtain a lytic serum by the injection into animals of pure cultures of amœbæ which by their technique they had succeeded in obtaining from the pus. These cultures were able to produce abscesses containing living amœbæ when inoculated subcutaneously in the guinea-pig. No complement-fixation bodies could be detected in the patient's blood serum when alcoholic and saline extracts of the amœbic cysts were used as antigens. The important observation was made that cysts which closely resembled the form described as *Entamœba minuta* are found in the feces of pyorrhea cases, and might give rise to error in the diagnosis of dysentery; these cysts are believed to be those of E. gingivalis. The investigation was not mainly concerned with the clinical aspect of the question, but it was noted that emetin was of no value in treatment. Mechanical injury was thought to have an exceedingly important rôle in the commencement of the disease, which almost invariably starts as a marginal gingivitis. Following the injury the spirochætes, such as Sp. vincenti, appear to play the chief part in the disease, causing destruction of tissue and the formation of pockets in which pyogenic cocci and other organisms find a good breeding-ground and toxin formation and absorption can go on continuously.

[*Journal of Experimental Medicine*, Baltimore, August 1, 1917.]

Influence on the Healing of Wounds of Variations in the Osmotic Tension of the Dressing.

BY ALEXIS CARREL, DUNOÜY, P. LECOMTE, AND ANNE CARREL.

The possibility of a relatively exact study of cicatrization permitted by the calculations of the curve of healing of DuNoüy and by the control of bacterial counts affords a sound basis for experimental investigations.

The immediate purpose was to ascertain whether modifications in the osmotic tension of the dressing exert an influence on the rate of repair. Surface wounds already covered with granulating tissue were selected. Distilled water or hypertonic salt solution was applied to the surface of the wound by means of small perforated rubber tubes bound at the extremities and enveloped by a small cylindrical pad of Turkish toweling. The sterile liquid was contained in a flask placed about one meter above the patient's mattress and reached the flushing tube by means of a Murphy drop tube.

Another technique was also used to bring into contact the wound surface and the distilled water or hypertonic solution. Agar cakes containing distilled water or hypertonic sodium chlorid solution were applied to the surface of the wound.

The course of the concrete cases is gone into in detail. It appears that the chief obstacle encountered in the study of the action of non-antiseptic substances on the rate of cicatrization is the facility with which wounds become reinfected under an aseptic dressing. The conclusions from these experiments are: (1) The flushing of an aseptic granulating wound with hypertonic sodium chlorid solution or distilled water brings about an immediate reinfection, and (2) distilled water and hypertonic sodium chlorid solution do not modify to a measurable extent the rate of healing of an aseptic wound.

[*Journal of the American Medical Association*, September 1, 1917.]

Organic Changes in the Central Nervous System Probably Due to Focal Infections. By George W. Hall.

Hall acknowledges the vulnerable points which may be cited in reasoning from cause to effect in the history of the three cases upon which this paper is based. However, clinical evidence and resulting treatment in other cases not here reported prevailed upon him to present this article. The chain of infection leading from the tonsils and teeth to the central nervous system in these cases is not complete, since two of the patients are still living. It is generally accepted that the changes in the central nervous system are due to toxins rather than to the organisms themselves.

Case I: This was diagnosed as due to degenerative changes in the spinal cord, involving the anterior and lateral portions in the cervical region. Large tonsils and pyorrhea alveolaris of two mandibular incisors were present. In consultation Dr. Billings felt that the changes were of a multiple sclerotic nature, and that the primary infection came from the teeth.

Case II: This was diagnosed as an organic change in the anterior portion of the spinal cord in the lumbar region. A history of pyorrhea alveolaris was obtained, on account of which six teeth had been extracted. The only apparent cause for the changes in the central nervous system of this case originated in the teeth.

Case III: Necropsy revealed a moderate edema of the pia and a distinct non-suppurative inflammation in the right half of the upper portion of the pons, chiefly characterized by large accumulation of mononuclear cells about the vessels. The clinical symptoms were manifold and very diverse, *e.g.* diplopia, anesthesia in trigeminal area, hiccup, vomiting, hemiplegia, etc. Necropsy revealed a broncho-pneumonia. Apart from the trigeminal anesthesia, the sole item of apparently dental interest is that a left hemiplegia quite suddenly developed, subsequent to an exacerbation of the pyorrhea alveolaris.

[*British Dental Journal*, London, July 2, 1917.]

The Effects of Organic Acids upon the Teeth. By H. P. Pickerill.

This note is barely more than a reiteration of Pickerill's well-known views on this topic. The main action of organic acids, in the right strength and quantity, in the oral cavity is as salivary stimulants. To be accurate, it is not the effect of organic acids on the teeth which must be considered, but the effect of organic acids plus stimulated saliva on the teeth.

An appended table, summarizing a few experiments, shows a marked increase in the alkalinity and amylolytic power per minute for the saliva following the ingestion of fruits—banana, orange, apple—over the alkalinity and amylolytic power of "resting" saliva and saliva poured out after the eating of bread and butter or cake.

A point which finds repeated insistence is that the question of dosage is of extreme importance.

The resistance of the teeth varies enormously. Of this Pickerill is convinced, despite the usual deductions from the work of

Tomes and Black. It is the *physical* and not the chemical consistence which is the essential thing in determining the resistance of teeth to acids. Instruments of precision indicate that teeth vary in hardness and in density. Weak acids indicate that teeth vary in solubility, and silver nitrate indicates that teeth vary in permeability. These differences are partly developmental and partly acquired.

These are points which find expression in Pickerill's early work, and are re-emphasized on this occasion to correct certain misconceptions which have arisen among his critics.

[*Journal of the Allied Dental Societies,* New York, September 1917.]

Oral Diseases of Ancient Nations and Tribes. By Kurt H. Thoma.

Thoma's purpose in this article is "to contribute in a modest way to the knowledge of the dental diseases of these ancient nations, with the hope of encouraging other men to study any specimens which may be at their disposal."

In the Peabody Museum of Harvard University he examined about 250 skeletons of the ancient Egyptians, dating from 2000 B.C. back for an unknown length of time.

Many of their dental troubles appear to have come from the over-use of the teeth by mastication of very hard food. Abrasion is found not only in the skulls of old people, but even affecting the deciduous teeth of children. Quite frequently the teeth had been worn down to such an extent that the pulp became involved, and enormous suppurative destruction sometimes followed. Such conditions are found in great numbers, and apparently it was not evident to the people of those times that extraction of the tooth would have speedily cured the trouble.

The existence of malocclusion is indicated by oblique abrasion.

No evidence of fillings with gold could be found in this collection.

There is some support for the view that a surgical procedure was resorted to to give drainage to the pus that had accumulated inside the bony alveolus.

There is little evidence of decay. Among the many specimens examined there were only two jaws which showed decay, and in each of these there was only one tooth affected; both specimens dated prior to 4800 B.C.

Impacted and unerupted teeth are found to have occurred during this same period.

In addition to the collection of Egyptian crania, there was a large collection of ancient Peruvian skeletons available for Thoma's study. There is abundant evidence that they suffered severely from dental disturbances. Abscesses of the jaws were of frequent occurrence, apparently no attempt to cure by extraction having been made. Many irregularities in the eruption of the teeth were noted. One specimen indicated the condition of cleft-palate and hare-lip.

[*Australian Journal of Dentistry,* Melbourne, July 1917.]

Cast vs. Swaged Plates. By C. E. Allen.

Allen would prove indisputably that a cast plate is the superior of its swaged relative alike in fit, rapidity, and ease of production, with less expenditure of labor and time, and in durability.

The old swaging method involves at least eleven processes, viz, impression, model, shaping of model to get rid of undercuts, sand, or calcar; die, counterdie, striking-up, chasing, cutting out plate for bands, constant annealing and pickling, soldering of bands. The cast method involves at most seven processes, viz, impression, model, wax plate, investment, burning out, casting, and soldering of bands. Likewise the apparatus demanded for the swaging method is far more extensive than that required for the cast method.

In Allen's opinion, plaster is the sole material which will meet the demands of impression-taking. The wax plate is never placed in hot water, and cotton is never used to press the wax into place. It is simply placed in position and pressed into shape with the fingers and the aid of the warm hand or breath. Ten to fifteen minutes is all that is necessary for this step. The plate is frequently taken from the model to test if it has become adherent, and if so is immediately freed. To prevent this adhesion the model is painted with a solution of soap. A thin coat of investment is painted on all the exposed parts, and when fairly set another coat is painted on. The thin coat of investment painted on first will give enough rigidity to the investment and wax plate without the production of much heat to allow the wax model to be withdrawn safely from the plaster cast. Painting on of the investment material on the opposite—palatal or mandibular, *i.e.* the side in contact with the mucosa—surface is done upon similar lines, and when all the coatings are set and all is clear of the model, further thick coatings can be safely made. Sprues or a sprue are placed upon the lingual surface of the plate, and should be made in wax. The invested wax base-plate model is then placed in a ring of suitable size. The whole process up to this stage will occupy about twenty-five minutes.

About four or five hours are usually spent in burning out the wax and bringing the investment to the required temperature. The complete dispersion of the carbonized wax model is essential to success. The investment should be kept at a high temperature during the casting.

Apparently Allen uses for the metal platinous gold of 18k. He warns against the use of scrap metal, *i.e.* anything likely to contain cadmium or zinc or other easily crystallizable elements. He uses a cold wet asbestos pad to produce the pressure required for casting, such as is generally used for cast inlays.

[*Practitioner*, June 1917.]

Treatment of Neuralgia and Neuritis by Ionization and Diathermy. By JOHN McGINN.

Although McGinn does not here describe this method as applied to the trigeminal region, its applicability there might be useful. To treat neuralgia with salicylic ions, lint or felt pads are saturated with a 10 per cent. solution of sodium salicylate. The pads are well moistened with hot water, the dry salicylate dusted over the wet surface, and an additional piece or two of lint laid over the salicylate powder. They must be proportional in surface area and in depth to the milliampèrage intended to be used. Lead or tin foil, connected carefully to conducting wires attached to the negative pole, is laid on and firmly smoothed to the outer surface of the pad; the whole is then covered with a suitable piece of mackintosh or muslinet, and secured to the body by a 3-inch bandage. The indifferent pad, saturated with salt solution and with a larger surface than the active one, may be applied, for instance, to the symmetrically opposite part of the body. Direct current, sinusoidal current, or a combination of the two, may be used. The quality of the current will depend on the result required.

Treatment by diathermy is in many respects preferable to ionization. Dry application of electrodes may be adopted, time is economized, and a larger quantity of current can be passed through the body. A through-and-through heating of the tissues is a very important result of its action. Its application may be made by a fine metal foil applied directly to the slightly dampened skin by immersing the foil in warm water, or by an absorbent pad about 5 mm. thick soaked in strong salt solution interposed between the skin and the electrode. The size of the foil depends upon the region to be treated. Care must be observed that neither electrode becomes detached from its support during treatment, as a very severe burn will be rapidly produced by the free terminal. When an uncomfortably hot sensation is experienced, reduction of the current must be effected at once, or a burn will ensue. In about twenty minutes, where the treatment is applied to the arm or leg, the current may be reduced to zero, switched off, and the bandage and pads and electrodes removed. A suitable dusting powder to render the skin surface comfortable is desirable. The treatment is to be repeated on alternate days for two or three months.

[*American Journal of Medical Sciences*, Philadelphia, September 1917.]

Case of Adamantinoma Showing Epithelial Pearls. By STUART GRAVES.

This report is submitted because the case, that of an adamantinoma developing purely from adamantoblasts, showed epithelial pearls and occurred in a negro boy of sixteen years. Clinically the tumor had appeared to be an osteosarcoma. It had been first noticed about one year before as a swelling of the gum, had grown gradually, and been painless. It involved a portion of the right maxilla. Its gross appearance is carefully described. Microscopically it was characterized by small to fairly large, irregular, sharply outlined, branching masses of compact cells. The grouping of the tumor cells suggests the arrangement of the compact epithelial cells in a hair-matrix carcinoma.

Five months after the operation, the technique of which is not given, there was no sign of recurrence. Adamantinomata, although rare, occur with a much greater frequency in the black than in the white race.

[*British Dental Journal,* London, August 15, 1917.]

Pivot Crown with Post to Fit the Root-canal. By Theodore Barton.

A great objection to the ordinary pivot crown is that the post in no way resembles the size or shape of the root-canal. Barton, in brief, outlines a technique by which to remedy this fault, together with the casting of post and backing in one piece.

The root is carefully ground at the cervical margin, and the canal should be opened as nearly conically as possible. A nickel-silver pin is fitted into the canal. The pin is then covered conically with wax, pressed up into the root-canal which previously had been oiled, and excess of wax trimmed off. This is left in position while an impression is taken, which on being removed draws the pin out. A platinum-pin tooth is then fitted into the model made from this impression. Wax is pressed into the root-canal. The excess is used to form the backing of the tooth. To this whole a sprue is attached and the whole invested and cast. The result is an easily made crown with a perfectly fitting post and diaphragm. Interchangeable facings may be substituted for the platinum-pin tooth, in which case the porcelain facing is removed before investing.

[*International Journal of Orthodontia,* St. Louis, August 1917.]

Indications for the Use of the X-ray in Orthodontia. By J. D. McCoy.

McCoy is particularly fitted to advise with authority on this highly important topic. The tender age of the usual orthodontic patient necessitates tact and gentleness on the part of the operator if confidence is to be maintained, and every precaution should be taken to rid the operation of fear and discomfort. With this in mind, the author has found it an advantage to use the extra-oral method quite universally—strictly, in nearly all cases except for the region of the anterior maxillary teeth. "The author has found it an advantage to use the ordinary chair with a straight back and small arms, placed against the back of the dental chair. The head-rest of the dental chair is turned over and adjusted to the proper height, position, and angle to support the patient's head. If the extra-oral method is being utilized, the head-rest wings are flattened out to make a resting-place for the plate. In this way the patient's head is afforded the firm support of the heavy dental chair, while the plate is held in an immobile state without difficulty, and the operator can, by making a few changes in the position of the small chair, and by moving and readjusting the head-rest, have radiographic access to any part of the dental structures."

McCoy summarizes the indications for using the X-ray by the orthodontist as follows:

(1) As a means of determining the presence or absence of unerupted permanent teeth before treatment is started.

(2) As a means of determining the approximate size of unerupted teeth for which space must be made in the arches.

(3) To determine the state of development of unerupted teeth which are tardy in their eruption.

(4) To determine the approximate direction in which teeth are erupting, and the relationship which they will have to the line of occlusion when erupted.

(5) As a guide where it is necessary to make attachments to unerupted teeth to aid in their eruption.

(6) To determine the most opportune time for the extraction of the deciduous teeth.

(7) To observe the movement of the roots of teeth, and their relationship to other roots and structures.

(8) To determine the relationship of developing third molars to certain recurrent malocclusions, and also as a precaution so that steps may be taken to prevent these teeth from becoming a cause of malocclusion during their eruption.

(9) To observe non-vital teeth prior to tooth movement, to determine their fitness for movement or anchorage, and their state of health during the process of orthodontic treatment.

(10) In cases where anomalous teeth are present, to differentiate between anomalous and normal teeth.

This paper is accompanied by a wealth of illustration, which vividly impresses the reader with the utility of X-ray control for each of the above-mentioned indications.

[*Dominion Dental Journal,* Toronto, August 1917.]

Note on Flavine, Sodium Desoxycholate, and Quinin as a Mouthwash. By F. M. Wells.

Any chemical which would act as a bactericidal agent, which at the same time would not destroy the life of cells and inhibit phagocytosis, and which could be applied to such a delicate surface as the mucous membrane without causing an irritant action, would satisfy a long-felt want in mouth and throat treatment. Wells believes that the formula given below meets these requirements. Bile salts exert a marked solvent action on pneumococci, amœbæ, and spirochætes. Pneumococci are also specially sensitive to solutions of quinin.

In his experiments the most favorable results were obtained from a solution of the following: Desoxycholate, 2 per cent.; quinin, 0.25 per cent.; flavine, 1 : 2000.

After the use of such a mouthwash as this, the bacterial count, even after four hours, was in most cases considerably lower than the control before the treatment, whereas with the more irritating antiseptic solutions the count rises rapidly after the initial fall, until it reaches a figure in excess of normal. Wells considers this secondary rise in the number of bacteria to be a useful indication of an irritant effect on the oral mucosa.

[*Practitioner,* London, August 1917.]

Contributory Causes of Cancer of the Throat. By W. S. Low.

Among the most constant conditions present in cases of cancer of the throat is sepsis of the throat from dental caries, pyorrhea alveolaris, or septic gingivitis. Normally the oral fluids are alkaline in reaction, but in the presence of these septic conditions they become acid. The increased irritating effects of such acid fluids on the mucosa of the throat is considerable, and may well prove a contributory factor to cancer of the throat.

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PERISCOPE

Finishing Occlusal Surfaces.—To polish deep grooves in inlays, cast crowns, or dummies, employ dull fissure or round burs in the engine, after which a beautiful finish may be secured by polishing with a small brush wheel, charged with polishing material.—N. R. Smeltzer, *Dental Review.*

Amalgam Restorations and Occlusion.—The one great objection to amalgam is the fact that many men shorten the bite somewhat every time they insert an amalgam filling by excessive trimming to protect the still plastic material. The nature of the material influences the operator to trim until perfect occlusion is lost.—Karl G. Knoche, *Dental Summary.*

To Work Ames' Black Copper Cement.—This may be worked so as to allow more time before the mix sets if mixed upon a cold-water bottle slab. The fluid cement may often be dropped into place in the tooth, when it almost flashes into a set, so quickly does it harden as it acquires the tooth temperature. Also in setting crowns, copper cement mixed upon the cold slab offers similar advantages, and may we not thus eliminate the disgusting putrefaction of material absorbed in zinc cement under crowns?—J. F. F. Waltz, *Dental Review.*

Use of Floss.—Ribbon floss should be used to polish the approximal surfaces of the teeth at least once each day, and I recommend the application of a little paste or powder to the floss before using it. Care should be taken when passing tape between the contact points not to allow it to snap against the gum tissues. Snapping the floss against the gums can be avoided by taking a short hold on the tape, keeping it taut, and holding the buccal end somewhat higher than the lingual, so that the tape passes diagonally between the contact points with a sawlike motion.—F. H. Skinner, *Dental Summary.*

Wax Patterns for Inlays.—In making wax patterns for compound cavities the contact point should be disregarded until the wax is thoroughly adapted to gingival, buccal, and lingual surfaces by the use of thin strips. Then add small amounts of hot wax until the contact is gained. After the inlay is polished, if it is found deficient at the contact point a small piece of 18k. solder sweated on will quickly restore it.—VICTOR H. FUQUA, *Dental Review.*

Measuring Root-canals.—I get better results by using iridio-platinum wires for radiographic work. An assortment of different sizes and lengths, finished to a fine point at one end, is kept on hand, and if sterilized before and after using they can be used indefinitely. Gages 23, 24, and 25 are the sizes I mostly use. This saves the operator time in having them ready for each case, and tends to standardize the work.—HOMER ALMON, *Dental Review.*

Interpretation of Roentgenograms.—The reading of a roentgenogram depends upon the difference in density of the various tissues. Enamel, which is dense, will appear a very light gray, while the living pulp tissue will be a very dark gray. Lack of tissue or of density will appear very black, while gold crowns and filling material will appear very white. Thus a good radiograph should possess good whites and blacks and intermediate tones of gray. The presence of small, round amalgam fillings on the buccal and lingual surfaces should be noted, as these are likely to appear as small pulp stones in the pulp chamber.

After two and a half years' experience in doing X-ray work I feel that I can state with safety that the average abscess cavity or deficient root-canal filling is very evident in the negative, and the diagnosis is very simple. However, there are cases that are extremely difficult to read, and the writer can only suggest the careful taking into account of the clinical symptoms, and in the event of failing to reach a satisfactory diagnosis the referring of the case to a specialist or radio-dentist.—A. H. GUNN, *Oral Hygiene.*

Use of Toothpicks.—There has been a good deal said about toothpicks, pro and con, one person advocating a quill and condemning a wooden toothpick, and his next-door neighbor holding just the opposite view. If food has jammed between the teeth, I would advocate the quickest means of getting it out, whether with silk floss or toothpicks, using care not to injure the gums, for it is commonly believed that a great deal of infection takes place through these little abraded surfaces. In fact, I think rubbing the tooth surfaces and gently massaging the gums with a wooden pick is productive of good results, for it stimulates the circulation, and breaks up and removes microbic plaques and other débris. The pernicious habit of systematically jamming a toothpick into interproximal spaces, crowding the gum tissue down and then giving the pick a twist, thereby lacerating and cutting the gums, should always be watched for and stopped, for the little pockets formed by the recession of the gums from this cause are places where débris lodges, and they make an ideal incubator for growing bacteria, thus infecting the gums and producing inflammation, which causes serumal deposits to gather, and pyorrhea will follow.—F. H. SKINNER, *Dental Summary.*

Care and Use of the Toothbrush.—A new brush should always be soaked in water over night so that the bristles will be pliable. After using, the brush should be well washed and then filled with a pure soap, such as castile or ivory, and laid away for the next using. When the soap is washed out with running warm water, the brush bristles will be clean and pliable, and in the best condition for use. The brush may be kept in water between tooth-cleaning, thus insuring softened bristles.

The brush is held limply in the right hand with the tips of the fingers, the thumb and forefinger holding the handle close to the bristles, the first, second, and third fingers on the back of the brush, the thumb and little finger underneath. The thumb and forefinger act as the pivot about which the brush rotates as it moves around the arch to accommodate its fullest action to the curves and surfaces of the dental arch. The second and third and little fingers act as the motors which move the brush handle, maintaining it parallel to the plane of occlusion as the brush is moved around the arch.

Relax all muscles, and carefully insert the brush into the mouth, carrying it back to the last upper right molar region without touching the teeth or gums until the brush is laid high upon the gums, the bristles pointing downward, and at an angle of about 45 degres. Keep the side of the back of the brush as close to the gums as possible without touching them, and lightly draw the brush vertically downward over the gums and teeth. This forms the working stroke which cleans and gently massages the gums, including the gum septa.—HENRY BARNES, *Dominion Journal.*

X-Ray Measurements of Root-canals.—There seems to be a well-grounded opinion that root measurements taken from films are very uncertain, and usually unreliable. I have always believed quite the opposite. In order to have satisfactory and definite reasons for the dependence I place on the films, I have made a number of accurate records—almost 100. In every case during the past year where I had X-ray films and was to remove a tooth, a root, a crown with metal posts, or a post that was used for retaining a filling, or, in a few cases, pieces of broken broaches, I have always made accurate measurements on the films, made a definite record of these measurements, and then compared the actual measurement after the root or tooth was removed, and am able to report that more than 90 per cent. are absolutely accurate.

There is no denying that films may be made showing great distortion, but it has not been my experience to have many such films. All of the lower and most of the upper teeth can be accurately measured, with the exception of upper molars—and I only except a certain percentage of those. We may get pictures showing the length of roots that are very accurate. When the roots of the first or second molar are spread widely apart and the rays are at a bad angle, we will get a film with the roots very much distorted. The few exceptions, however, do not alter the fact that most films can be made to accurately register the length of the roots.

This is a valuable asset in the treatment of root-canals, and should be used by every practitioner who desires to render the best professional service. To fail to make use of this most important help because a very small percentage of the radiographs will be distorted is about as good reasoning as the operator's who fails to attempt to make any good root-filling because a few teeth have badly curved roots which preclude the possibility of thorough root-filling. It is folly to hide behind the statement that some roots are so crooked that no operator can successfully fill them. Only a very small percentage of the roots we are called upon to treat have curved roots such as to be placed in the doubtful class.—F. W. Gethro, *Dental Review*.

Band and Shell Crowns as Bridge Abutments.—The greatest harm done by fixed bridge work has resulted, not because they were fixed, but from the faulty foundations upon which they were built. We must depend upon our foundations for the success of any superstructure, and the most popular foundation for our fixed bridge work has been the banded crown or shell crown that has been fitted to the abutment tooth. Allow me the privilege of withdrawing the word "fitted," since I have seen precious few that fit. My condemnation of the practice of banding teeth will be as severe as the results usually obtained by their application warrants, and that is extreme. More misery, more pyorrhea, ill health, and even death from systemic conditions have been produced by the irritation of bands than from any other thing in dentistry, excepting the improper filling of root-canals. These seem harsh and broad statements, but are borne out by clinical evidence, and cannot be refuted. It is absolutely impossible to fit a cylinder of metal, no matter how thin, over a conical-shaped root and obliterate the margin of the cylinder. No operator, with any knowledge of cavity preparation, would think of finishing a filling to any but a margin cavity, and yet this fact is forgotten when preparing a tooth or a root for a band. Even though a band be wonderfully adapted, one little concavity unnoticed by the operator in the root surface, at the margin of the band, allows the band at this point to stand off, and here irritation begins its process of pyorrhea. However, I know that a few men place many, and more men place a few bands that hug the tooth so closely at the gingival portion as to produce little irritation, and in some very resistant mouths, none at all. These crowns give valuable service. However, the rank and file, and they are in the vast majority, do not even approximate a fit to the root, and how many crowns of this kind are in mouths today, very slowly but steadily and surely destroying the teeth to which they are cemented? They may protect the crown of the tooth and make sturdy abutments for bridges for a time, but they are a very decided, constant and destructive irritant to the soft tissue, and nature, through pyorrhea, in trying to get rid of the irritant casts off the tooth with it as surely as it would slough out a sliver in the hand. If this were all we might still tolerate it, but it is not. How many of our physical troubles may be traced to some focus of infection arising from the irritation of this band we do not yet know, but we have had enough indication of them to make us fear their numbers. Therefore a system of practice in which so great a chance for tooth destruction and injury to bodily health prevails is wrong, and we must seek something better.—Karl G. Knoche, *Dental Summary*.

OBITUARY

Dr. Peter K. Filbert.

[SEE FRONTISPIECE.]

DIED, at Ashland, Pa., at the home of his brother-in-law, Dr. D. S. Marshall, April 20, 1917, from an attack of apoplexy, PETER KALBACH FILBERT, D.D.S.

Peter Kalbach, son of Samuel and Katherine Filbert, was born June 6, 1850, at his father's farm near Womelsdorf, Marian Township, Berks county, Pa.

His early education was obtained in the public schools of his native township. Later he took up the study of dentistry with Dr. Hameker of Womelsdorf, and entered the Pennsylvania College of Dental Surgery, from which institution he was graduated as Doctor of Dental Surgery in the spring of 1873. He at once opened an office for practice in Pottsville, Pa., in the service of which community his entire professional life was spent.

Dr. Filbert was a member of the National Dental Association, the Pennsylvania State Dental Society, and the Schuylkill County, the Susquehanna, the Lebanon Valley, and the Reading societies, and was at one time president of the Pennsylvania State Dental Society, also was a charter member and first president of the Schuylkill County society, and one time president of the Lebanon Valley society, serving as its presiding officer from 1882 to 1889.

Fraternally, he was a member and a past master of Pulaski Lodge No. 216, F. and A. M.; a member and a past high-priest of Mountain City Royal Arch Chapter No. 196; a member and a past commander of Constantine Commandery No. 41, Knights Templar; a member of Rajah Temple, A. A. O. N. M. S. of Reading, Pa.; a district deputy grand high-priest of the Grand Holy Royal Arch Chapter of Pennsylvania; a member and vice-president of the Sphinx Club of Pottsville; a member of the Independent Order of Odd Fellows; a member of the Knights of the Golden Eagle, a charter member of the Pottsville Club, a charter member of the Central Building Association, of which he acted as secretary for many years, also a member of its board of directors; a charter member of the Schuylkill Trust Company, of which he was the second vice-president and a member of the board of directors.

Dr. Filbert in his nearly half a century of professional relationships and activities acquired, by his fine personality, his excellence as a dental practitioner, and his broad-minded and sympathetic attitude toward humanity, a position in his community, and with all with whom he came into contact professionally or socially, a standing which but relatively few achieve. His skill as a practitioner quickly won for him a large *clientèle.* His sound judgment, his unassailable integrity, his judicial attitude of mind in dealing with professional affairs, led many to seek his counsel and his leadership in the direction of professional and private matters. His was a life of high ideals well lived, and his profession and the community which he served have reason to be grateful for the influence and uplift they have derived from the life activities of Dr. P. K. Filbert. He has left a record of professional rectitude, of community service, and of civic helpfulness which will be an inspiration to all who knew him.

Dr. Filbert was married February 25, 1875, to Julia M. Sell of Womelsdorf—who, with four daughters and one son, Edward S. Filbert, a dental practitioner, survives him.

His remains were interred in the family lot in Charles Baber Cemetery, Pottsville, April 23, 1917.

The Schuylkill County Dental Society has adopted the following resolutions on the death of Dr. P. K. Filbert, of Pottsville, Pa.:

Whereas, Almighty God, in His infinite wisdom, has seen fit to remove from the scene of his earthly labors our esteemed colleague Dr. P. K. Filbert; and

Whereas, the Schuylkill County Dental Society, of which he was an honored member, recognizing his great worth as a dentist, ever ready to work for the uplift of the dental profession, desires to record its appreciation of him as a man and its sense of sorrow at his death; therefore be it

RESOLVED, That the members of this association extend to the family of the deceased their sincere sympathy in their bereavement, and that this resolution be spread upon the minutes of the Schuylkill County Dental Society, and that copies be forwarded to the dental journals for publication.

C. M. BORDNER,
W. C. SCOTT,
G. W. C. ENTERLINE.

DENTAL LEGISLATION

Act of Congress Relating to Army Dental Service—According Equal Status as Between Medical and Dental Corps.

PUBLIC—NO. 86—65TH CONGRESS. [H. R. 4897.]

AN ACT

TO PROVIDE FOR THE PROMOTION OF FIRST LIEUTENANTS IN THE REGULAR ARMY AND NATIONAL GUARD TO THE GRADE OF CAPTAIN, AND RESPECTING THE DENTAL CORPS OF THE ARMY AND MEDICAL AND DENTAL STUDENTS, AND FOR OTHER PURPOSES.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

That during the existing emergency first lieutenants in the Medical Corps of the Regular Army and of the National Guard shall be eligible to promotion as captain upon such examination as may be prescribed by the Secretary of War.

Hereafter the Dental Corps of the Army shall consist of commissioned officers of the same grade and proportionally distributed among such grades as are now or may be hereafter provided by law for the Medical Corps, who shall have the rank, pay, promotion and allowances of officers of corresponding grades in the Medical Corps, including the right to retirement as in the case of other officers, and there shall be one dental officer for every thousand of the total strength of the Regular Army authorized from time to time by law: *Provided further,* That dental examining and review boards shall consist of one officer of the Medical Corps and two officers of the Dental Corps: *Provided further,* That immediately following the approval of this Act all dental surgeons then in active service shall be recommissioned in the Dental Corps in the grades herein authorized in the order of their seniority and without loss of pay or allowances or of relative rank in the Army: *And provided further,* That no dental surgeon shall be recommissioned who has not been confirmed by the Senate.

All regulations concerning the enlistment of medical students in the Enlisted Reserve Corps and their continuance in their college course while subject to call to active service, shall apply similarly to dental students.

APPROVED OCTOBER 6, 1917.

ARMY AND NAVY DENTAL NEWS

A Volunteer Dental Service for Army Training Camps.

OFFICE OF THE
SURGEON-GEN'L, WASHINGTON,
September 18, 1917.

THE Dental Committee of the General Medical Board, which is the agency for the medical and dental preparedness in this war emergency, has made it possible for every dentist in the United States to assist in this work, under the direction of the Surgeon-general's Office, Headquarters War Department, Washington, D. C., and under the direct supervision of First Lieut. William A. Heckard, D.R.C., U.S.A., on active duty and stationed in New York City.

The dentists of the Eastern Division, which comprises New York, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia, proceeded with the care of the mouths of the troops now mobilizing, and the showing made has been sufficiently good to warrant extending this work through all the States of the Union; therefore it behooves all to get busy at once, and we need your help—need every man to give all the time he possibly can.

In the new 42d Division just ordered to France, composed of regiments from twenty-six states, the 69th Regiment, N. Y. N. G., owing to the work of the Preparedness League of American Dentists in New York City, is the only one dentally fit—a result of which New York may be proud.

If the Allies are going to win, each one must do his or her part. Every bit of service rendered helps to shorten the war.

Women and children are knitting sweaters, socks, helmets, et cetera, and making bandages, surgical dressings, and fracture pillows. You and I cannot do these things, but we can fill and extract teeth, and *no one else can*—that is part of our job.

Tabulated records will be forwarded to the War Department giving the name of every dentist who has volunteered service under the conditions here outlined, with a memorandum of the work done by each man. Do you want your name to be missing from this Honor Roll? Wake up, brother! Let's get shoulder to shoulder like the boys in the trenches. They are giving all their time (and their lives and their limbs) and undergoing cheerfully, untold hardships, while we stay at home in comfort. Will you give part of your time, or aren't you a real American? This is YOUR war. Some men are giving all their time for this dental service, others are giving half their time. We ask you for at least one hour each day.

The Dental Committee of the General
Medical Board, Co-operating with the
Dental Profession.

LIEUT. W. A. HECKARD, D.R.C.,
Detailed by the Surgeon-general's Office.

Extract from the Debate in Congress upon the New Army Dental Act.

SENATOR POMERENE ON ARMY MEDICAL AND DENTAL EQUALITY.

THE act to provide for the promotion of first lieutenants of the medical corps in the regular Army and National Guard to the grade of captain, and respecting the dental corps of the Army and medical and dental students was approved by the President on October 6th. (See act, as printed at page 1169.)

Senator Pomerene was responsible for the Senate amendment relating to the dental corps. Senators Warren and Overman opposed an amendment to the bill in the Senate, on the ground that the House would not accept it in the final hours of the session. Both senators, however, expressed approval of the provisions of the amendment. Senator Pomerene refused to withdraw his amendment, and when the matter was taken up in the House it was agreed to after some vigorous protests were made about legislating for a permanent *personnel* in an amendment having no relation to the subject matter of the bill.

Senator POMERENE, among other things, said:

"The amendment offered by the senior Senator from Massachusetts, which I shall present as an amendment to the bill, affects the dental officers of the army. It has seemed to me since I have been in the Senate that there has been a disposition, in some quarters at least, to discriminate against the dental profession, but if there ever was a time in the history of this country when the dental profession should be cared for it is now, because of the method of trench warfare which is in vogue in Europe today. Many of the injuries sustained by the soldiers are to the face and the mouth, and the work which is done by the dental profession has commended itself to the admiration of the world.

"I do not like to look upon dental surgeons as if they were a separate and distinct profession. It seems to me they are specialists in one branch of surgery, and if we are going to do what is just to the medical profession—and I am glad the committee is seeking to do that—I shall ask at the same time that there be a modicum of justice extended to the dental profession. For that reason I shall offer this amendment if the Senate takes up the bill for consideration."

When the House passed the bill on October 5th, Representatives Gordon and Stafford severely criticized the method by which the legislation was brought before the House.

Representative TOWNER, of Iowa, favored the bill, and said:

"Mr. Speaker, under ordinary circumstances I am inclined to think that many of us would concur in the criticisms that have been made by the gentleman from Wisconsin (Mr. Stafford) with regard to the fact that this amendment has been brought in so late in the session. However, I think the criticisms that are made upon the substantive parts of the bill are not well founded. This matter has been under consideration both in the House and the Senate. It has received the consideration of the Committee on Military Affairs. It has the approval of the Surgeon-general's department. There is nothing asked that is extraordinary in its nature or character. We must have these dental officers. They are already provided for. The only question raised here is as to whether or not they shall occupy the anomalous position of being a part of the Surgeon-general's department, a part of the medical staff, or whether they shall have a distinctive position which shall still be under the Surgeon-general's department but which will be separately recognized as a dental department. That, it seems to me, is entirely a matter that ought to be approved by the House, but that is not the most serious question. If we vote down the passage of this bill it will not only kill that provision but it will kill the whole bill. Certainly the provisions of this bill are important enough now that they should be passed at this session. It is an emergency act. Its provisions are important, and we should pass it at this time. I presume there has not been a single bill passed to which objections could not be made."
—*Army and Navy Register.*

Regulations Governing the Discharge of Interns and Students from Draft under the Law of May 18th.

[The following regulations concerning the enlistment of medical students in the Enlisted Reserve Corps, and their continuance in their college courses while subject to call to active service, will, under the dental act approved October 6th (see page 1169) apply in like manner to dental students.—Ed.]

Office of Surgeon-gen'l, U. S. A.
September 4, 1917.

The following regulations governing the discharge of hospital interns and medical students from draft under the selective-draft law of May 18, 1917, have been made by the President:

"*First.* Hospital interns who are graduates of well-recognized medical schools or medical students in their fourth, third, or second year in any well-recognized medical school who have not been called by a local board may enlist in the Enlisted Reserve corps provided for by Section 55 of the National Defense Act under regulations to be issued by the Surgeon-general, and if they are thereafter called by a local board they may be discharged on proper claim presented on the ground that they are in the military service of the United States.

"*Second.* A hospital intern who is a graduate of a well-recognized medical school, or a medical student in his fourth, third, or second year in any well-recognized medical school, who has been called by a local board and physically examined and accepted and by or in behalf of whom no claim for exemption or discharge is pending, and who has not been ordered to military duty, may apply to the Surgeon-general of the Army to be ordered to report at once to a local board for military duty, and thus be inducted into the military service of the United States, immediately thereupon to be discharged from the National army for the purpose of enlisting in the Enlisted Reserve corps of the Medical department. With every such request must be inclosed a copy of the order of the local board calling him to report for physical examination (Form 103), affidavit evidence of the status of the applicant as a medical student or intern, and an engagement to enlist in the Enlisted Reserve corps of the Medical department.

"Upon receipt of such application with the named inclosures the Surgeon-general will forward the case to the Adjutant-general with his recommendations. Thereupon the Adjutant-general may issue an order to such intern or medical student to report to his local board for military duty on a specified date, in person or by mail or telegraph as seems most desirable. This order may issue regardless of the person's order of liability for military service. From and after the date so specified such person shall be in the military service of the United States. He shall not be sent by the local board to a mobilization camp, but shall remain awaiting the orders of the Adjutant-general of the army. The Adjutant-general may forthwith issue an order discharging such person from the military service for the convenience of the Government.

"Three official copies of the discharge order should be sent at once by the Adjutant-general to the local board. Upon receipt of these orders the local board should enter the name of the man discharged on Form 164A, and forward Form 164A, together with two of the certified copies of the order of discharge, to the mobilization camp to which it furnishes men. The authorities at the mobilization camp will make the necessary entries to complete Form 164A, and will thereupon give the local board credit on its net quota for one drafted man."

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(1) It will be observed that paragraph *First* of the foregoing deals with interns and students who shall *not* have been called by a local board, and provides that they may enlist in the Medical Enlisted Reserve corps under regulations to be issued by the Surgeon-general, such enlistment entitling them to discharge from draft if thereafter called.

(2) An application for enlistment under this paragraph must be forwarded to the Surgeon-general with the affidavit of the applicant, supported by the certificates of his school authorities, showing his present status as intern or student, and particularly how long he has been an intern, in the one case, or the year of the medical course that he is pursuing, in the other.

(3) An intern who has served one year or more as such will not be enlisted in the Medical Enlisted Reserve corps under this regulation.

(4) An intern who is enlisted in the Medical Enlisted Reserve corps hereunder will be called into active service under his enlistment, if his services are needed, at the end of one year of internship. Applications for commission in the Medical Reserve corps, from interns who at the expiration of one year's internship are called for duty as members of the Medical Enlisted Reserve corps, or from interns whose year of internship is about to expire, will receive proper consideration.

(5) A medical student (undergraduate) who is enlisted in the Medical Enlisted Reserve corps hereunder will be called into active service under his enlistment, if his services are needed, upon failing to pass from one class to another, or upon failing to graduate.

(6) The *Second* paragraph above quoted deals with interns and students who *shall have been* called for service by a local board under the selective-draft law, and contemplates their discharge from the draft, upon condition that they shall enlist in the Medical Enlisted Reserve corps.

(7) It will be the policy of the Surgeon-general as a rule to recommend discharge from the draft upon the condition indicated, the discharge to be followed by a call to active duty under the enlistment in the Medical Enlisted Reserve corps at the expiration of a complete year of internship or upon the failure of the student (undergraduate) to pass to the next higher class or to graduate.

(8) Interns and students who are enlisted in the Medical Enlisted Reserve corps by virtue of these regulations, and are not called into active service under such enlistments, are required to report their status to the Surgeon-general as follows: Interns, at the end of each three months' period, such report to show the total amount of internship since graduation, and to be countersigned and attested by the medical superintendent of the hospital; students, at the end of each semester, such reports to show whether the student qualified for advancement, and to be countersigned by the deans of their respective schools or by subordinate officers representing the deans.

(9) In the execution of these regulations the department will not recognize internships in hospitals, sanitariums, or other institutions conducted for profit, or in small private hospitals (50 beds or less), or new internships established or added since May 18, 1917, to those previously existing, at any hospital, excepting such as may have been newly established and added by reason of a proportional increase in the bed capacity of such hospital; nor will it recognize internships in the case of any graduate appointed thereto later than August 1st following his graduation.

By order of the Surgeon-general:

Robert E. Noble,
Lt. Colonel, Medical Corps.

Aid of Dentists in Fitting Men for the Army Outlined.

More than 21,000 men of the National Guard and National Army were examined in New York City between June 16th and September 6th, and more than 24,000 dental operations performed to send the men to camp as dentally fit as possible. The same work has been going on in other parts of the country. It is under the charge of the dental division of the Surgeon-general's office, which has worked in co-operation with the dental profession and the Preparedness League of American Dentists.

Dentists without exception gave their time and the materials necessary for the work.

2872 Dental Officers on Roll.

The Surgeon-general of the Army completed the enrollment of and now has at his disposal 178 Dental Corps officers, 221 National Guard dental officers, and 2473 Dental Reserve Corps officers, making a total of 2872 dental officers subject to duty. This is enough to supply, in the proportion of 1 dentist to 1000 men authorized, an army of 2,872,000 men. This enrollment of dental officers has been accomplished in five months, although there has been only the rank and pay of first lieutenant to offer members of the dental profession. No further dental officers will be required in the immediate future. With the approval of Surgeon-general Gorgas, permission was obtained from Provost-marshal General Crowder to order accepted selective service men to appear for dental examination before civilian dentists volunteering to render gratuitous service. The law allows 1 dentist to each 1000 men in the line of the army. By means of the volunteer work done it is believed that all dental work urgently needed will be completed before the men are sent on foreign service.

Many Giving All Their Time.

Examinations are being conducted in a number of places. In New York City, where two or three nights a week are set for examinations. 1000 men are examined on each of these nights. Between 400 and 500 dentists have volunteered for service there, and a minimum of one hour is given by each from his regular operating time, and in addition all necessary materials are furnished at the dentist's expense. Some dentists are giving all their time to this gratuitous work.

Maj. Wm. H. G. Logan is in charge of the dental division of the Surgeon-general's office. First. Lieut. W. A. Heckard, D.R.C., has been in charge of the work under volunteer dentists in New York City, where the largest number of men have been examined.—*Official Bull. Gov't Com. on Public Information.*

Army Dental Corps.

No action will be taken on the new legislation, approved October 6th, in relation to the Army Dental Corps [the text of which is published in full elsewhere in this issue—see page 1169], until the Judge Advocate-general's opinion as to the construction of the statute is approved by the Secretary of War. Such interpretation has been asked by the Surgeon-general. If it be considered that the enlisted strength, which will be the basis of numbers and the proportion in grades, is 300,000, there will be, of course, 300 officers of the corps, and as early as may be determined now this will serve to create 9 colonels, 16 lieutenant-colonels, 71 majors, and 203 captains and first lieutenants. Promotions will be made by seniority.

Commissions are being prepared this week for 60 officers recently appointed to the regular dental corps, the announcement of the qualification of whom was contained recently in our columns.—*Army and Navy Register.*

Army Dental Reserve Corps Full.

There will be no more examinations of applicants to the Dental Reserve Corps for the present. There is now a sufficient number of dentists enrolled to care for an army of 3,000,000 men, or about three times as many as would be called to the colors at this time.

There are two exceptions made to the abovementioned discontinuance of examinations:

First: Since this department will have need of certain dental specialists in various locations in this country and abroad, applications will be considered of such men as are specially well qualified in such branches as the needs of the army may demand. The dental spe-specialists needed at this time are to be found among those who have had experience in the management of fractures of the jaws, and in minor or major oral surgery. Applications for appointment in the dental reserve corps will, therefore, be considered of men qualifying in the work above outlined.

Second: When a dentist is drafted and has been physically accepted by those in charge of the camp where the dentist has been sent as a private, he may then make application for appointment in the dental reserve corps through the proper dental surgeon there in charge, who will promptly have completed papers sent to the department for final action, when an additional number of dental officers are required.

Applications already received will be placed on file and the applicants informed when the examinations to the dental reserve corps are resumed.—*Army and Navy Register.*

Army Dental Corps: Examinations.

An examination for appointment as officers of the Army Dental Corps will begin on November 12th at the army stations where such examinations are usually held. Those who were appointed as a result of the July examinations were recommended for commission on September 12th.

Military Dental Society formed at Camp Grant, Rockford, Ill.

Officers Dental Reserve Corps.

The members of the Dental Reserve corps of Camp Grant, Rockford, Ill., met on September 17, 1917, for the purpose of organizing a Dental Society. The aim of this society is to arrange for papers on dental and closely allied medical subjects for the instruction of its members, as well as to arrange for musical entertainments, etc. It is hoped this move will be general among the dental surgeons of all army camps in the United States, so that it will become a National Association of Dental Societies for mutual benefit.

Further announcements will follow later.

Officers and Members: Capt. H. O. Scott, U. S. A., honorary president; 1st Lt. C. A. Patterson, president; 1st Lt. John P. Garriott, vice-president; 1st Lt. Geo. L. Felcher, secretary; 1st Lt. H. F. Bohle, treasurer; 1st Lt. E. A. Heinz, publicity correspondent. A. M. Aronberg, R. A. Adkins, S. R. Ewen, F. W. Gale, — Gallagher, P. W. Clopper, H. E. Haines, H. W. Hennis, C. H. Hatch, Otto Kolar, Stanley B. LaDue, C. L. Lane, J. L. Meredith, H. R. Newton, J. A. Rapp, K. F. Smith, P. H. Plummer, E. F. Sullivan, C. D. Washburn, Arthur C. Wood.

Automobile Army Dental Office.

ARMY officers stationed in New York have been interested during the past week in the inspection of an automobile dental office for the army. Lieut. Clark J. Hollister, a dentist and member of the Pennsylvania division headquarters troop at Camp Hancock, Ga., exhibited the car. The "dental office" on wheels was given to him for use in the Pennsylvania division by his father, D. W. Hollister, secretary-treasurer of the Internations Commercial Corporation, 44 Whitehall st., New York. It is complete in every detail of equipment and can go anywhere an automobile can go.

Mrs. G. W. Childs Drexel of Philadelphia contributed the equipment, which cost $1800. In the portable office is a dental chair, a wardrobe, hot and cold water, cases for dental instruments, and tanks for ether and "laughing-gas."—*Army and Navy Register.*

New Naval Dental Surgeons.

CANDIDATES have been found qualified for appointment as dental surgeons in the Navy with the rank of lieutenant, junior grade, for a probationary period of two years, as follows:

H. A. Badger, Washington; J. M. Campbell, Washington; S. C. Claytor, Washington; W. E. Coverly, Chicago; W. T. Davidson, Philipsburg, Pa.; W. A. Dorney, Newtonville, Mass.; C Hansen, New York; P. F. Kennedy, Hadley Falls, Mass.; H. J. Lehman, New London, Conn.; L. E. McGourty, Washington; H. Mann, Philadelphia; J. W. Ridgway, Washington; H. A. Sturtevant, Cambridge, Mass.; and John A. Walsh, New Britain, Conn.

There will probably not be another examination for appointment to the naval dental corps until December or January.

Assignments.

Army Dental Reserve Corps.

Week ending September 22d.

1st Lieut. Crawford B. Dowdell, Dental Reserve Corps, to Fort Des Moines, for duty.

1st Lieut. James T. Cannon to Gettysburg, Pa., for duty.

1st Lieut. Newton E. Erwin to Fort Oglethorpe for duty.

1st Lieut. George C. Booth to Fort Des Moines for duty.

Following to Camp Devens, Ayer, Mass., for duty: 1st Lieuts. Stanley H. Baldwin, Fay T. Bowen, Myers Brownstone, Gregory P. Cassidy, William B. Cobb, Maurice D. Corrigan, Joseph M. Creegan, Frederick W. Day, James F. Dobson, Nathan H. Finkelstein, Carolus R. Given, Walter Grandage, Thomas F. Greene, Thomas J. Guilfoil, James B. Harrington, Harvey L. Haskell, Oswald W. Holmes, James H. Keith, Paul O. Kluttig, Michael Krall, Harold J. McGinn, Ralph H. Metters, Thomas B. O'Leary, Thomas E. Power, Ralph B. Putnam, Norman C. Spencer, Harold A. Stone, Harold L. Stover, Chester H. Tannebring, John E. Tyler, Edmund M. Webb, Virgil A. Widdoes, William G. Williams, Louis Witz, and James F. Wynn.

1st Lieut. Roy G. Strickler to duty with 5th New Jersey infantry, Pompton Lakes, N. J.

Following to Presidio of San Francisco for duty: 1st Lieuts. Lester C. Hunt and William W. McCrillis.

Following to camps for duty: 1st Lieuts. Kent W. Phillips, Camp Sevier, Greenville, S. C.; 1st Lieut. Herbert R. Boyd, Camp Lee, Petersburg, Va.; 1st Lieut. Harry W. Donovan, Camp Gordon, Atlanta, Ga.; 1st Lieut. Edward F. Rabe, Camp Gordon, Atlanta, Ga.

1st Lieut. Lucius A. Butler to Fort Des Moines for duty.

1st Lieut. Robert W. Hammons to Camp Gordon, Atlanta, Ga., for duty.

1st Lieut. Ira D. Funkhouser to Fort Benjamin Harrison for duty.

Following to Jefferson Barracks for duty: 1st Lieuts. Mendsay M. Dexter and Orlin C. Stuart.

Following first lieutenants to camps indicated for duty:

To Camp Lewis, American Lake, Wash.: Waldo J. Adams, Adolph A. Anderson, Melville C. Babington, Harry E. Bengtson, Nona P. Bennett, Earl O. Billings, Ernest D. Buettell, John L. Burnside, Munn Q. Cannon, Henry J. Carleton, Hubert F. Christianson, Ray F. Cole, Walter E. Cole, Leon B. Collier, Charles A. Couplin, Franklin C. Dallimore, Wooster H. Fisk, George L. Gallagher, Solomon J. Z. Gantz, Howard A. Hale, George R. Heap, Charles S. Irwin, Orlando J. Johnson, John B. Kennedy, John A. Kimmel, Winfred P. McDaniels, Thomas G. McMartin, George A. McMonagle, Ralph I. Mills, Conrad E. Mortensen, Melvin O. Nelson, Benjamin F. Pound, Seymour S. Skiff, Harold D. W. Pineo, James L. Roark, Lief Norman Tommerson, and Lyman F. Wagoner.

To Camp Lee, Petersburg, Va.: John S. Allen, Edward A. Beddoe, Francis J. Canning, Albert Cartun, Carlyle B. Cleland, L. N. Cooper, Burton A. Courtright, Aaron R.

Crane, Harold F. Doyle, Frank P. Gormley, Thomas A. Holton, Frank O. Hood, George McC. Kiner, Victor P. Klapacs, Theodore E. LaFayette, Jr., Harold R. Lamb, Ernest R. Lathan, Leonard E. Loveridge, Robert R. Luce, Daniel F. McCarthy, Arthur B. McCormick, John H. MacDermott, Wilber H. Morrill, Louis Olin, Joseph H. Parsons, Harry E. Petterson, Frank D. Pierce, George A. Rigg, John J. Ross, James E. Ryan, Alexander Schwartz, Walter F. Sullivan, Creston Sutch, and John B. Williams.

To Camp Meade, Annapolis Junction, Md.: Melvin M. Augenstein, Harry P. Bachman, Daniel T. Bowers, William O. Boss, Edward S. Bracken, Jr., Leigh H. Breisch, Charles L. Cassell, Charles H. Clairborne, Jr., Harry W. Deegan, Charles G. Dentry, Jr., Hubert H. Elslager, David G. Everhart, Robert F. Fox, Samuel Friedlander, Thomas H. Harding, Charles P. Hatrick, Sidney C. Hoffman, Marcus C. Horning, Hervey C. Manon, Jerome B. Marshall, John C. McElhaney, Paul T. Nelson, William B. Noble, James L. Olsen, Edwin J. Reichel, Harry B. Riley, Eli B. Rosser, Louis Rossman, Rumsey F. Rowdybush, John G. Shaffer, John G. Showalther, John W. Snyder, Donald S. Sterrett, and Howard E. Swartz.

To Camp Dix, Wrightstown, N. J.: Charles J. Balbach, Frederick F. Bruch, William G. Buchanan, Lawrence F. Campbell, Joseph A. Colman, Bernard J. Connolly, Jr., John F. Connolly, Howard M. Davis, Paul J. DeLong, Herbert Dewar, Robert A. DeWitt, Frank E. Dougherty, Frank J. Ernst, John A. Flood, Jesse B. Gearhart, Charles T. Gilden, Jr., Ralph E. Gill, Guy L. Haman, Clarence H. Hapgood, Thomas F. Healy, Geo. A. Hussey, Jr., Walter E. Lotz, William R. Lutz, William E. McCain, Louis McMaster, Ray M. McNulty, William H. March, Albert Mehrer, Allen L. Murphy, Robert E. Price, Fred H. Swanson, Thomas H. Travilla, Richard J. Walsh, Philip H. Woods, and John I. Wyckoff.

To Camp Upton, Yaphank, Long Island: Carl G. Anderson, Roscoe L. Barber, Howard F. Berkey, Frederick H. Brophy, Gerald G. Burns, Harry B. Butler, Claude R. Christopher, James L. Clements, John L. Davis, Herman G. Ebling, Cecil G. Fletcher, Charles W. Frieman, Isidor Girsdansky, Leslie A. Gould, William E. Graf, Foster F. Harrower, Harry G. Hindes, Charles W. Hlavac, William E. Jenney, Ralph F. Krueger, Victor Lekowski, Harold J. Loomis, John Mann, Jr., George C. McMullen, Joseph J. Millard, Eldorus H. Palmer, Arthur C. Roblin, Fernando E. Rodriguez, John W. Schelpert, Jr., Isadore Shapiro, and George G. Starke.

To Camp Jackson, Columbia, S. C.: George N. Abbott, Joseph A. Ahern, Edwin C. Baker, David S. Bedrick, William M. Bergen, Preston M. Blanton, Norman E. Boylston, Chester K. Brown, Louis H. Cadorette, George V. Cannon, Irving P. Carr, Wilbur A. Charron, William A. Connelly, Joseph A. Corriveau, James E. Cox, William L. Davidson, Charles A. Forbush, Louis A. Haffner, Melville W. Haynes, and Aaron LaF. King.

To Camp Wheeler, Macon, Ga.: Kyle B. Alsobrook, Isaac H. Archer, Isaac O. Bishop, Jr., Harry T. Bledsoe, Mathew A. Boykin, Henry C. Carver, Owne L. Chestnutt, Herman W. Cook, Thomas Crenshaw, Jr., Henry G. Fain, Frampton W. Farmer, Judge W. Fowler, Josiah B. Game, Jr., William G. Geffcken, Robert L. Hart, Marion C. Izlar, Paul K. McGee, Hope H. Payne, Idus W. Shields, George F. Waldo, W. Chester Wall, and Clarke B. Weeks.

To Camp Shelby, Hattiesburg, Miss.: William McC. Armantrout, Troy L. Babcock, Raleigh F. Benham, Roy L. Bodine, Frank W. Boville, Milo Bushong, Geo. H. Carberry, John T. Cosler, Louis M. Daum, Samuel H. Davis, Reginald L. Felton, Douglas D. Godwin, Harry F. Gravelle, Edgar T. Haynes, Melvin H. King, Chester K. Little, Otho L. McKay, Hale H. Pearsey, Earle Robbins, Harold C. Roberts, Glen B. Ross, Mark J. Rozelle, William J. Stark, Edgar Welsh, Raymond H. Williams, and George A. Withrow.

To Camp Dodge, Des Moines, Iowa: Fred C. Allender, Donald D. Cornell, E. E. Courtright, Harry E. Cunningham, Arentz J. Ericson, Max C. Frazier, Clint H. Harrison, Harvey B. Haselton, Gerrit H. Hospers, Charles F. Huber, Claude L. Hunsicker, Peter P. Laude, Gordon B. Logan, A. M. Mauer, James W. McGuire, George W. Mikulas, Lumir M. Mikulas, William O'Neill, Thomas L. Rice, Paul W. Richardson, Stanton L. Sherman, Roy S. Sommers, James C. Stanton, Emory O. West, and James E. Wright.

To Camp Taylor, Louisville, Ky.: Finnie E. Crawford, Abram R. Adams, Walter J. Allison, Julius Altman, James E. Bailey, William J. Barto, Howard Bock, Arthur E. Brown, Clement R. Ellis, DeForrest W. Ewing, Roy D. Gabbert, William H. Hatcher, Roy H. Kernohan, Cameron E. Lane, John O. Lessig, Alevie R. Livermore, Jr., Bernard B. Lowdenback, Howard R. Ludwig, Charles A. Mallon, David P. McQuillan, Jr., Charles P. Mayhall, Edgar J. Moore, Louis M. Nelson, James F. Owen, William R. Russell, Joseph F. Sheridan, Leo Shonfield, James G. Steiner, Delmar H. Stocker, Sylvester H. Straessley, Oscar W. Thompson, and Andrew B. Waddle.

To Camp Sherman, Chillicothe, Ohio: Clarence F. Berry, Robert A. Buchman, Raymond

F. Coleman, Ray C. Comstock, Rozelle M. Cope, Edw. K. Corwin, Milton J. Damlos, Carl K. Denbow, George W. Derks, William A. Earton, Max F. Gruber, James F. Hannon, Frank F. Happy, Starling E. Kay, Claude M. Kemper, Ormsby Keselring, Benjamin J. Light, Ralph D. Linn, Edward B. Lodge, Earl D. Lowry, Edward L. Markley, Edwin Miller, John J. Miller, Henry M. Morrison, Ray W. Osborn, William F. Palmer, William E. Park, Henry D. Rand, James H. Reid, and H. Elwood Schedine.

To Camp Grant, Rockford, Ill.: Robert A. Adkins, Emil L. Aison, Albert M. Aronberg, Ralph Burkhart, Paul W. Clopper, Clyde E. Duncan, George L. Felcher, Frank Willis Gale, John C. Gallagher, John P. Garriott, Harlan E. Haines, Charles H. Hatch, Elmer A. Heinz, Harry W. Hennis, Otto Kolar, Stanley B. LaDue, Creighton L. Lane, Jesse L. Meredith, Herbert R. Newton, Clayton A. Patterson, Perry H. Plummer, Jerome A. Rapp, Kenneth F. Smith, E. F. Sullivan, and Arthur C. Wood.

To Camp Funston, Fort Riley: Arthur P. Alexander, Olly C. Ammons, Robert J. Ballinger, Charles F. Barr, William E. Beard, Clifford W. Bogan, Maurice A. Case, Thomas J. Cassidy, Glen R. Chafee, Daniel N. Colburn, Vern L. Cowan, Benjamin H. Crawford. Vernon W. Davis, Henry W. Ernst, Arch G. Fee, Archie C. Gottenborg, Alfred F. Groebner, Newton C. Gunter, Meredith E. Helm, John A. Jumer, Edmund F. Lieb, Frank F. Logan, Albert C. Maxwell, Francis P. Meany, John C. Metcalf, James T. Moffitt, Earle W. Nelson, Francis H. Prosser, Leon M. Radke, Clyde W. Scogin, Robert O. Smith, Oscar L. Whitson, James C. Williams, Jonas T. Williams, Jr., and Harry W. Wilson.

To Camp Custer, Battle Creek, Mich.: Lawrence E. Aldrich, Robert M. Allen, William R. Beattie, Sperry B. Claypool, Robert L. Donaldson, Grove W. Dunham, Albert W. Farley, Howard W. Geiger, Warren E. Guerrier, Frank L. Hardy, Chauncey H. Jones, Luzerne G. Jordan, Lyman L. Jones, Clarence P. Landgrebe, Cornelius Locke, William C. Melvin, Will W. Mitchell, Walter B. Reeves, Louis E. Reif, Arthur H. Schallheim, Herbert J. Schiewetz, Roy A. Stout, Glenn A. Showerman, Shubael C. Stratton, George P. Taylor, Albert E. Thornberry, Jr., Harold J. Thorne, Jay Clinton Thuman, Clair U. Walker, Harrison B. Wall, and Marcus J. Wielage.

To Camp Logan, Houston, Tex.: Milton H. Anderson, Raymond V. Brandt, William D. Burns, Robert G. Carper, Nathan S. Chapman, Victor Y. Coulter, Joseph A. Cullen, Charles E. Davis, Harris B. Frampton, Charles S. Greusel, Fred W. Hoffman, John J. Holland, Harry L. Leedham, Warren E. MacGregor, Harold H. Miller, Ira B. Mowry, William M. Nesler, Fritz A. Pierson, James F. Purney, Ralph A. Sears, Walter Sorenson, Denzil B. Walters, and William A. Walzem.

To Camp Travis, Fort Sam Houston: Egbert E. Baker, Roy E. Barr, Louis Bergeson, Roscoe Bristow, Carver R. Brown, Rex P. W. Capwell, William Z. Carroll, George W. Crook, Harold C. Hillman, Earl O. Kalk, Henri Letord, Clarence I. Lillehei, Chester H. Langley, Albert W. Marshall, Morell D. McKenzie, Melvin A. Miller, Howard M. Morrissey, Arthur H. Nobbs, John E. Olson, Louis L. Podruch, Harold F. Poser, William L. Smith, Roy E. Wheeler, Odon J. Wilda, Leigh J. Woodworth, and Alex. J. Zimmer.

To Camp MacArthur, Waco, Tex.: Lisle P. Ambelang, Albert W. Anderson, Edwin R. Anderson, Ernest G. Borthwick, William E. Boyle, Victor I. Buss, William R. Cashin, Erwin W. Chamberlain, John E. Connell, Joseph L. Cummings, Dennis J. DeMunck, John W. Elbert, Jerry R. Hayward, Arthur A. Hoffman, Archie R. Houns, Paul A. Howell. Franklin M. Huson, Howard D. Mertz, Raymond A. Ross, Rantz E. Snoberger, Floyd E. West, and Walter LeR. Wilson.

To Camp Doniphan, Fort Sill, Okla.: Edward M. Atkinson, George L. Bennett, Jacob W. Chiles, Charles A. DeWolf, Claude E. Frazier, Ed Granger, Porter E. Gray, George E. Halley, Elmer C. Hansen, Otto L. H. Hine, Edward F. Keys, Harry B. Laird, Harvey N. Lewis, James F. Maness, DeLorme B. Robinson, Geo. E. Roland, Elliott H. Rowland, William D. Rush, Burnham E. Shaw, Walter C. Shull, Warren S. Whittle, Loos E. Wiley, and Neal D. Williams.

To Camp Gordon, Atlanta, Ga.: John G. Arbenz, Albert L. Bartlett, William N. Crowl, Ellsworth E. Eskey, George E. Fussell, Neale R. Gunn, James F. Hall, Miguel Wise Jackson, George R. Lee, Earl N. McCue, Thomas M. Page, William E. Paul, Forrest DeW. Suggs, and George E. Walker.

To Camp McClellan, Anniston, Ala.: Culmer C. Benton, Malcolm Bethea, Pierce A. Cassedy, Edgar A. Creighton, Walter M. Dunlap, George H. Elliott, Geo. A. Ferrell, Alfred K. Franklin, Morris Golden, Joseph S. Hamilton, Vaughn L. Maxwell, Albert B. Pancoast, Leon Reisner, Harry M. Trafford, Harold Van Blarcom and William A. Wood.

To Camp Pike, Little Rock, Ark.: Edgar T. Blocher, Merle W. Catterlin, Thomas M. Collins, Frank L. Cooper, Jesse J. Corlew, Fred W. Dains, Roger L. Dill, George H. Elliott, Frank J. Fehrenbacher, James W. Ferguson, LeRoy M. Fink, Walter S. Francis, Grant C. Gentry, Roy C. Hoel, Francis M.

Kane, Clarence P. Jackson, Charles A. McDermand, Richard W. McLean, DeWilton H. Milstead, Doyle B. Morris, Leo B. Muzzy, Brien B. O'Bannon, Charles E. Porter, Robert Redus, Henry W. Rich, James H. Shaw, and Frank R. Woods.

To Camp Beauregard, Alexandria, La.: John F. Ailworth, Edgar C. Berryman, William H. Brockman, William L. Conrad, Harry J. Dunshee, James M. Gray, Pierre O. Landry, Percy W. Pou, Bernard Ragland, Ruford A. Rice, William I. Setzekorn, Smith C. Tanner, William V. Thomson, Albert G. Tillman, Jr., Ralph B. Tudury, William W. Westmoreland, Jr., Roy White, and Walter F. P. Zell.

To Camp Kearny, Linda Vista, Cal.: Harold Anderson, William Gordon Barnum, Alfred E. Bernstein, Wall M. Billings, Fred W. Burlingame, Richard M. Cerf, George B. Curtis, Francis E. Derham, Howard Dunn, Clarence A. Flanagan, Russell W. Force, John E. Frates, Maxwell T. Green, Henry L. Harris, Albert N. Johnson, John W. Leggett, Claude E. Markey, Arthur B. Mitchell, Samuel Shapiro, George A. Snyder, James F. White, and John J. White.

To Camp Mills, Garden City, Long Island: Charles H. Brown, Charles H. Cole, Howard I Denio, Albert L. Geisenhoner, Joseph J. Dodson, Walter H. Harnisch, Leroy E. Knight, Ralph M. Knight, John R. Maxon, Harold R. Mead, Daniel B. Newton, George W. Phelan, Arthur Picker, John P. Reading, Jr., Stanley S. Reynolds, Hamilton D. Smith, George E. Staats, John C. Tooke, Hugo M. Volmeke, James D. White, and Frederick H. Williams.

To Camp Sheridan, Montgomery, Ala.: Walter J. Ebell, Francis A. Boylan, Elmer O. Doyle, Joseph E. Eden, Cecil W. Girvin, Ernest H. Goering, Joseph I. Hartwig, Roy M. Jernall, Leon M. Muedeking, Edwin J. T. Simon, and Joseph P. Werrick.

To Camp Greene, Charlotte, N. C.: George T. Baskerville, Jr., Thomas J. Bland, Jr , Julian B. Haller, Rollo I. Pusey, and Beaman Story.

To Camp Sevier, Greenville, S. C.: Walter F. Clayton, James G. Crutchfield, Wallace D. Gibbs, Ernest S. Hamilton, John H. Hughes, Benjamin C. Jones, Leslie J. Meredith, Robert H. Murphy, Alexander W. Nance, and Clarence H. Rangeley.

To Camp Hancock, Augusta, Ga.: Walton J. Graft, George I. Jacquin, William B. Ley, Claude A. L. Lyon, Thomas W. Magner, William H. McElnea, Robert W. Meeker, Thomas C. F. Shirley Floyd D. Soverel, and Raymond LeR. White.

To Camp Wadsworth, Spartanburg, S. C.: Clarence J. Appleget, John C. Dickinson, William M. Kester, Kenneth C. Pruden, Lee F. Strickler, and Harry L. Westney.

To Camp Bowie, Fort Worth, Tex.: Albert B. Crutcher, William F. Murphy, Rue P. Parcells, Nealie E. Ross, Harold B. Smith, and Orrin K. Weaver.

To Camp Cody, Deming, New Mex.: Leroy C. Anderson, Louie T. Austin, Ingvald G. Bergh, Leonard C. Brusletten, Erwin F. Bruss, Archibald B. Butter, John J. Curran, Ray D. Curry, Patrick M. Dunn, Magnus A. Gerde, A. E. Nannestad, Albert W. Odell, Eldred C. Oswald, George H. Ribbel, Francis R. Steirly, Roscoe E. Stewart, Lewis R. Stowe, James J. Weeks, Louis R. Weiss, and Wayne W. Wooley.

To Camp Dodge, Fort Des Moines: Martin M. Block, Walter P. Christiansen, Leo V. Daniels, Oakley B. Davey, Francois J. P. DeGrasse, George N. Frost, Laverne H. Jacob, Ernest O. Lawing, and Melford S. Sorley.

The following first lieutenants to camps for duty: Camp Gordon, Atlanta, Ga., Junius F. Emerson; Camp Grant, Rockford, Ill., Stanley G. Ewen; Camp Jackson, Columbia, S. C., Edward H. Dobson; Camp Kearny, Linda Vista, Cal., John H. Davis and James H. Johnson; Camp Meade, Annapolis Junction, Md., Wegor E. Mathison; Camp Pike, Little Rock, Ark., John F. Clark, Charles H. Masters; Camp Sevier, Greenville, S. C., Willard J. Worsley; Camp Gordon, Atlanta, Ga., Samuel B. Ginsburg and Bernard R. Thornton.

1st Lieut. Denzil C. Barnhill to Fort Benjamin Harrison for duty.

1st Lieuts. William W. Peebles and Samuel H. Rosenberg to Fort Des Moines for duty.

1st Lieut. George A. Hewey to Yaphank, Long Island, Camp Upton,. for duty.

1st Lieut. Theron J. Hickey to Fort Oglethorpe for duty.

Week ending September 29th.

1st Lieut. J. R. Adams, to Camp Gordon.

1st Lieut. F. B. McAdams, to Fort Benjamin Harrison.

1st Lieut. J. H. Ross, to Camp Grant with 21st engineers.

1st Lieut. F. P. McCarthy, to Camp Upton.

1st Lieut. C. F. Kohlmier, to Camp Meade with 23d engineers.

1st Lieut. G. C. Wittet, to Camp Grant with 35th engineers.

1st Lieut. T. J. Hartigan, to Camp Devens with 25th engineers.

1st Lieuts. T. B. Davis, B. B. Dehaven, and E. C. Jones, to Fort Des Moines.

The following first lieutenants to camps for duty in division of plastic and oral surgery of base hospitals: Ivan E. Smith, Camp Wadsworth, Spartanburg, S. C.; Robert H. Nones, Jr., Camp McClellan, Anniston, Ala.; Stewart D. Ruggles, Camp Sevier, Greenville, S. C.; Peter J. Wunkes, Camp Wheeler, Macon, Ga.; Arthur C. Rohde, Camp MacArthur, Waco, Tex.; William P. Delafield, Camp Logan, Houston, Tex.; John J. Ogden, Camp Cody, Deming, N. M.; Clarence S. DeLong, Camp Doniphan, Fort Sill; William A. Baker, Camp Bowie, Fort Worth; Joseph A. Boarts, Camp Sheridan, Montgomery, Ala.; Pearly M. Fugler, Camp Shelby, Hattiesburg. Miss.; Thomas M. Terry, Camp Beauregard, Alexandria, La.; Vincent E. D. Bragg, Camp Greene, Charlotte, N. C.; Charles J. Meyer, Camp Devens, Ayer, Mass.; Charles W. Swing, Camp Dix, Wrightstown, N. J.; Edward F. Lafitte, Camp Jackson, Columbia, S. C.; Samuel L. Rambo, Camp Gordon, Atlanta, Ga.; Pope L. Marshall, Camp Sherman, Chillicothe, Ohio; Jay H. Lee, Camp Taylor, Louisville, Ky.; Sherman M. Fowler, Camp Custer, Battle Creek, Mich.; Merton M. Postle, Camp Grant, Rockford, Ill.; Ernest E. Buell, Camp Pike, Little Rock, Ark.; John Voss, Camp Dodge, Des Moines, Iowa; William H. McDonald, Camp Funston, Fort Riley, Kan.; Royal E. Wight, Camp Lewis, American Lake, Wash.; Henley E. Miller, Camp Kearny, Linda Vista, Cal., and Wilbert J. Scruton, Camp Meade, Annapolis Junction, Md.

1st Lieut. Coleman T. Brown, to Gettysburg, Pa., for duty.

1st Lieut. Harold J. Cutler, to Yaphank, Long Island, Camp Upton for duty.

1st Lieut. Herman A. Barkmann, to Fort Riley for duty.

1st Lieut. Joseph H. Hurdle, to Fort Caswell for duty.

The following first lieutenants to camps for duty: Camp Gordon, Atlanta, Ga., Junius F. Emerson. Camp Grant, Rockford, Ill., Stanley G. Ewen. Camp Jackson, Columbia, S. C., Edward H. Dobson. Camp Kearny, Linda Vista, Cal., John H. Davis and James H. Johnson. Camp Meade, Annapolis Juncion, Md., Wegor E. Mathison. Camp Pike, Little Rock, Ark., John F. Clark. Camp Sevier, Greenville, S. C., Willard J. Worsley.

Week ending October 6th.

1st Lieut. F. S. Leonard to Fort Benjamin Harrison.

1st Lieut. C. W. Hlavac to New York City for temporary duty.

1st Lieut. W. R. Snyder to Fort Thomas.

Week ending October 13th.

1st Lieut. H. M. Nolan, from Camp Funston, relieved from active duty.

1st Lieut. Harry Holmes, to Camp Gordon.

1st Lieuts. M. P. Bergeron, H. W. Burns, E. L. Desautels and F. K. Phillips to Fort Ethan Allen, temporary duty, then to Camp Greene.

The following from Camp Mills, Garden City, Long Island, to Tenafly, N. J., for assignment to engineers' service battalions: 1st Lieuts. Charles H. Brown, 501st battalion; Joseph J. Godson, 502d; John P. Reading, Jr., 503d, and Stanley S. Reynolds, 504th.

1st Lieut. Herman J. Brachman, to Mount Clemens, Mich., aviation school, for duty.

1st Lieut. Ferdinand D. Gratz, to Camp Lewis, Wash., for duty.

1st Lieut. Arthur P. Dixon, to duty with 6th field artillery, Fort Myer.

1st Lieut. Raymond L. Anglemire, to Little Silver, N. J., Camp Alfred Vail, for duty.

1st Lieut. John C. Mackin, to Gettysburg, Pa., reorganization camp, for duty.

1st Lieut. James A. Johnson, from duty with 5th engineers, Corpus Christi, Tex., to Fort Clark for duty.

The following to Fort Ethan Allen for temporary duty, thence to Charlotte, N. C., Camp Greene, for duty: 1st Lieuts. Maximilian P. Bergeron, Harry W. Burns, Edmond L. Desautels and Fred K. Phillips.

1st Lieut. Leonard G. Mitchell, to Camp Lee, Petersburg, Va., for duty at base hospital.

1st Lieut. Howard C. Feyler, to Columbus Barracks for duty.

1st Lieut. Myron W. Wilson, to Fort Oglethorpe for duty.

Army Dental Corps.

Week ending September 22d.

Capt. George H. Cassaday, from Douglas, Ariz., to Camp Funston, Fort Riley, for duty in charge of dental *personnel* and property.

1st Lieut. Ben H. Sherrard to Chillicothe, Ohio, Camp Sherman, for temporary duty in charge of dental *personnel* and property.

The following to camp for duty in charge of dentists and dental property: 1st Lieuts. Rex McK. McDowell, Garden City, Long Island; Herman S. Rush, Waco, Tex.; Minot E. Scott, Anniston, Ala., and Frank L. K. LaFlamme to Camp Meade, Annapolis Junction, Md.

Week ending September 29th.

Capt. Julien R. Berheim, from Camp Meade, Md., to Surgeon-general's office for duty.

SPECIAL NOTICES.

A War Need of the Government.

UNITED STATES CIVIL-SERVICE EXAMINATIONS.

Stenographers and Typewriters Wanted—Men and Women.

The United States Government is in urgent need of thousands of typewriter operators and stenographers and typewriters. All who pass examinations for the departments and offices at Washington, D. C., are assured of certification for appointment. It is the manifest duty of citizens with this special knowledge to use it at this time where it will be of most value to the Government. Women especially are urged to undertake this office work. Those who have not the required training are encouraged to undergo instruction at once.

Examinations for the Departmental Service, for both men and women, are held every Tuesday, in 450 of the principal cities of the United States, and applications may be filed with the Commission at Washington, D. C., at any time.

The entrance salary ranges from $1000 to $1200 a year. Advancement of capable employees to higher salaries is reasonably rapid.

Applicants must have reached their eighteenth birthday on the date of the examination.

For full information in regard to the scope and character of the examination and for application blanks address the U. S. Civil Service Commission, Washington, D. C.; or the Secretary of the U. S. Civil Service Board of Examiners at Boston, Mass.; New York, N. Y.; Philadelphia, Pa.; Atlanta, Ga.; Cincinnati, Ohio; Chicago, Ill.; St. Paul, Minn.; St. Louis, Mo.; New Orleans, La.; Seattle, Wash.; San Francisco, Cal.; Honolulu, Hawaii; or San Juan, Porto Rico.

JOHN A. MCILHENNY,
President U.S. Civil Service Commission,
WASHINGTON, D. C.

INFORMATION RELATING TO

Qualification for the L.D.S. Degree in Great Britain.

[THE following generalized information will be of interest to those who wish to prepare for the British dental qualification. The data given are those which apply to the complete standard curriculum, and are not inclusive of the regulations pertaining to recognition of foreign qualifications or to equivalency of credits for partial courses taken in British and foreign schools respectively. —ED.]

THE method of obtaining a registrable qualification in dentistry resembles that required for medicine and surgery. Both professions are controlled by the General Medical Council. The training of the dental student extends over a period of four years, and may be entirely carried out at a recognized dental school, or it may be acquired by part training at a dental school for two or three years and an apprenticeship of two years to a qualified dentist. The curriculum of the Royal College of Surgeons of England (Queen's Sq., London, W. C.), which is as follows, may be taken as an average of the requirements:

First Course. Theoretical and practical chemistry and physics: 180 hrs. lectures and practical work in chemistry and 120 hrs. lectures and practical work in physics. Pass the prelim. sci. exam. in chemistry and physics—same as that for L.R.C.P. and M.R.C.S.

Second Course. Two years' instruction in mechanical dentistry; lectures on dental metallurgy, with a practical course; lectures on dental mechanics, with practical work, including the manufacture and adjustment of six dentures and six crowns. Pass the 1st profess'l exam.: (1) Mechanical dentistry. (2) Dental metallurgy.

Third Course. Lectures on dental anatomy and physiology, dental histology, dental surgery, with practical dental surgery; surgery of the mouth, dental bacteriology, dental materia medica, and practical instruction in anesthetics—these at a dental school and hospital; and the following in a medical school: Lectures on anatomy, physiology, with practical physiology, surgery, and medicine. Dissections for twelve months. Practice of surgery and clinical lectures on surgery in a hospital for twelve months. Pass the 2d profess'l exam.: (1) General anatomy and physiology, general pathology and surgery. (2) Dental anatomy and physiology, dental pathology and surgery, and practical dental surgery. Before the final subjects are entered for, the candidate must have completed the four-years' curriculum and be twenty-one years old.

Similar conditions apply to the qualifications of the following colleges:

Royal College of Surgeons, Edinburgh. (Clerk, Mr. D. L. Eadie, 50 George Sq., Edinburgh.)

Royal Faculty of Physicians and Surgeons. Glasgow. (Address Mr. Walter Hurst, 242 St. Vincent st., Glasgow.)

Royal College of Surgeons in Ireland, Stephen's Green, Dublin.

Degrees in dentistry are granted by the Universities of Birmingham, Bristol, Dublin, Durham, Leeds, Liverpool, London, Manchester, and Sheffield. The medical schools mentioned above under the section dealing with medicine (with the exception of Charing Cross) have dental colleges attached. There are in addition the following dental schools:

Dublin. School of Dentistry, Lincoln Place. (Dean, Mr. Geo. Sheppard.)

Edinburgh. Dental Hospital and School, 31 Chambers st. (Dean, Mr. W. Guy, 11 Wemyss Place.)

Glasgow. Dental Hospital and School, 158 Renfrew st. and 15 Dalhousie st. (Dean, Mr. W. D. Anderson.)

London. National Dental Hospital, Great Portland st., W. (Dean, Mr. Sidney Spokes.) Royal Dental Hospital, Leicester Sq., W. C. (Dean, Mr. W. H. Dolamore.)—*Chemist and Druggist.*

SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS *not later* than the 11th or 12th of the month preceding that of publication.

National Mouth Hygiene Association.

DEPARTMENT OF EXTENSION LECTURES.

A COMPLETE lecture set, consisting of full manuscript and thirty-six specially selected and prepared lantern slides covering the subject of Mouth Hygiene, is furnished by this association to members of state dental societies and others who may be considered as qualified to present the subject on the lecture platform.

For rental and sale terms and other particulars address the undersigned.

EDWIN N. KENT.
Director of Extension Lectures,
330 Dartmouth st., Boston, Mass.

Forsyth Dental Infirmary for Children.

NEW DEPARTMENT—LIBRARY AND MUSEUM.

THE trustees and director of the Forsyth Dental Infirmary for Children have authorized the creation of a new department, to be known as the "Library and Museum." They solicit from the dental profession contributions of books and dental periodicals, particularly those out of print and not readily obtainable by purchase; also specimens of dental abnormalities, casts, or specimens of unusual structures of dental interest, for all of which permanent acknowledgment will be given.

FREDERICK A. KEYES, D.M.D.,
Librarian and Curator of Museum.

Virginia State Dental Association.

THE Virginia State Dental Association will meet in Roanoke, Va., April 25, 26, and 27, 1918.

F. R. TALLEY, *Corr. Sec'y,*
Petersburg, Va.

Ohio State Dental Society.

THE fifty-second annual meeting of the Ohio State Dental Society will be held in the Hollenden Hotel, Cleveland, Ohio, December 4, 5, and 6, 1917.

The program promises one of the greatest and best dental meetings ever held. Among the speakers already announced are Drs. T. W. Brophy, J. P. Buckley, N. S. Hoff, Carl Lucas, Richard H. Riethmüller, George H. Fette, and W. H. O. McGeehee. War Surgery will have a prominent place on the program.

A new feature, under the supervision of Dr. Weston A. Price, will be a Seminar, covering the entire field of non-vital teeth. "Evidence, not opinions, to be used," and to be comprised in a series of twelve ten-minute discussions, further exemplified by progressive clinics. Other clinics will cover the field of the management of vital teeth for supporting artificial substitutes.

There will be no general discussions; the entire time will be devoted to papers, lectures, and clinics. The display of dental supplies will be unusually complete, and Tuesday forenoon and Thursday afternoon have been set aside as special exhibitors' sessions.

Come for the first day's program, and bring notebook and pencil.

F. R. CHAPMAN, *Sec'y,*
305 Schultz Bldg., Columbus, Ohio.

Michigan Board of Examiners.

THE next session of the Michigan State Board of Dental Examiners for the examination of candidates wishing to practice dentistry in the State of Michigan will be held in the city of Ann Arbor (Dental College building) the week of November 5th to 10th inclusive. Applications should be made early, as all preliminaries must be complete and in the hands of the secretary not less than ten days prior to the examination. Photographs and itemized preliminary educational qualifications required of all candidates. Address

E. O. GILLESPIE, *Sec'y-treas.*,
Stephenson, Mich.

Nebraska Board of Examiners.

THE Nebraska Board of Dental Examiners will hold a regular meeting in Omaha, November 6, 7, 8, and 9, 1917, at the Creighton Dental College. For information address

S. A. ALLEN, *Sec'y*,
Loup City, Nebr.

Maryland Board of Examiners.

THE Maryland State Board of Dental Examiners will meet for examination of candidates for certificates on November 7 and 8, 1917, in Baltimore, at 9 A.M.

For application blanks and further information address

F. F. DREW, *Sec'y*,
701 N. Howard st., Baltimore, Md.

Vermont Board of Examiners.

A SPECIAL meeting of the Vermont Board of Dental Examiners for the examination of candidates to practice in Vermont will be held at the State-house, Montpelier, Vt., Monday, November 5, 1917.

To be eligible for examinations a candidate must be (1) twenty-one years of age, (2) a graduate of a high school of the first class, and (3) of a reputable dental college.

For further information apply to

HARRY F. HAMILTON, *Sec'y*,
Newport, Vt.

Connecticut Dental Commission.

THE Dental Commission of Connecticut hereby gives notice that it will meet at Hartford, November 15, 16, and 17, 1917, to examine applicants for license to practice dentistry, and for the purpose of transacting any other business proper to come before it. The necessary papers will be mailed by addressing

EDWARD EBERLE, *Recorder*,
902 Main st., Hartford, Conn.

California Board of Examiners.

THE next examination by the Board of Dental Examiners of California for a license to practice dentistry in that state will be held in San Francisco, beginning on the 7th day of December 1917, at 10 A.M.

All applications for examination must be filed with the board on December 7th. Each application must be accompanied by (1) the fee of $25; (2) necessary credentials (diploma and license from other states); (3) testimonials of good moral character, and (4) a recent unmounted photograph of the applicant.

C. A. HERRICK, *Sec'y*,
133 Geary st., San Francisco, Cal.

Pennsylvania Board of Examiners.

THE next examination of the Pennsylvania Board of Dental Examiners will be held in Musical Fund Hall, 808 Locust st., Philadelphia, and in the University of Pittsburgh, on Tuesday, Wednesday, Thursday, and Friday, December 4, 5, 6, and 7, 1917. The examination in operative dentistry will be held on Tuesday, December 4th, at 8.30 o'clock, in the Philadelphia Dental College, 18th and Buttonwood sts., Philadelphia, and the University of Pittsburgh; prosthetic dentistry on Tuesday, at 1.30. Application papers can be secured from the department of Public Instruction, Harrisburg. Address

ALEXANDER H. REYNOLDS, *Sec'y.*
4630 Chester ave., Philadelphia, Pa.

Oklahoma Board of Examiners.

THE next regular semi-annual meeting of the Oklahoma Board of Dental Examiners will be held in Skirvin Hotel, Oklahoma City, Okla., beginning December 10, 1917. For further information write

H. OVERBEY, *Sec'y*,
Ryan, Okla.

Colorado Board of Examiners.

THE Board of Dental Examiners of the State of Colorado will meet in Denver, Colo., Tuesday, December 4, 1917, at 8 A.M., for examination of applicants for license to practice dentistry in the State of Colorado.

In addition to the written examinations, applicants must supply their own patients, instruments, and materials, and come prepared to do practical work. Address

R. C. QUICK, *Sec'y*,
310 Metropolitan Bldg., Denver, Colo.

Iowa Board of Examiners.

The next meeting of the Iowa State Board for the examination of applicants will be held at Iowa City, Iowa, commencing December 3, at 9 A.M. For further information address

J. A. West, *Sec'y*,
417 Utica Bldg., Des Moines, Iowa.

Texas Board of Examiners.

The Texas State Board of Dental Examiners will hold its next examination in Dallas, beginning Monday, December 17, 1917. No diplomas exchanged, no reciprocity. All applications, accompanied by the fee of $25, should be in the hands of the secretary not later than December 12th. For further particulars and application blanks address

Harrison B. Cave, *Sec'y*,
810-14 Wilson Bldg., Dallas, Texas.

Idaho Board of Examiners.

The Idaho State Board of Dental Examiners will hold their next session at Boise, Idaho, January 14–17, 1918. Address

A. M. Jacobsen, *Sec'y*,
255 E. Center st., Pocatello, Idaho.

South Dakota Board of Examiners.

The South Dakota State Board of Dental Examiners will hold its next examination at Sioux Falls, S. D., beginning January 7, 1918. All applications must be in the hands of the secretary by January 1st. Fee $25. Address

Robert Jasmann, *Sec'y*, Scotland, S. D.

North Carolina Board of Examiners.

The next meeting of the North Carolina State Board of Dental Examiners will be held at Raleigh, N. C., beginning at 9 o'clock on Thursday morning, January 10, 1918. For further information and application blanks address

F. L. Hunt, *Sec'y*,
Asheville, N. C.

Montana Board of Examiners.

The Montana State Board of Dental Examiners will meet in Helena, Mont., January 14, 15, 16, 17, and 18, for the purpose of conducting examinations. Applications should be in the hands of the secretary not later than Janaury 1, 1918.

G. A. Chevigny, *Sec'y*,
107 Clark Block, Butte, Mont.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING SEPTEMBER 1917.

September 4.

No. 1,238,883, to Gilderoy O. Burlew. Dental tool for cleaning teeth.

September 11.

No. 1,239,633, to Frank H. Stickler. Dental-floss holder.

September 18.

No. 1,240,258, to Robert Finlay Robb. Artificial tooth.

No. 1,240,320, to Edward P. Dameron. Dental and surgical instrument.

No. 1,240,681, to Carl F. Crecelius. Toothbrush and dentifrice holder.

No. 1,249,731, to John James Kinehan. Orthodontic appliance.

No. 51,289, design, to Edward H. Shibley. Dental sanitary fountain.

THE
DENTAL COSMOS

VOL. LIX. DECEMBER 1917. No. 12.

ORIGINAL COMMUNICATIONS

The Treatment and Filling of Root-canals for the Prevention and Cure of Alveolar Abscess.

By J. J. MOFFITT, D.D.S., Harrisburg, Pa.

(Read before the New Jersey State Dental Society, Atlantic City, July 12, 1917.)

THERE has been so much attention directed lately to infected root-canals and their relation to general pathologic disorders that this subject must be given prominence in our study and treatment of root-canal conditions, while equally important is the development of a direct and simple method of treating and filling uninfected roots which will not permit of sinister conditions appearing subsequently in the apical area.

There is today so great a tendency to extract all teeth suspected of contributing to systemic disturbances that it would be well to review the functions of the teeth, and thus restore in our minds the incalculable value of every tooth to the body's welfare. Each adult should have thirty-two teeth, and retain them throughout life. One tooth missing makes a defective organism; the perfect design is spoiled. (See Fig. 1.) Even the much-despised third molar has its functions, but it often happens that early in life the circulation to its formative organ is impeded, and the space necessary for its unimpaired eruption and usefulness is encroached upon.

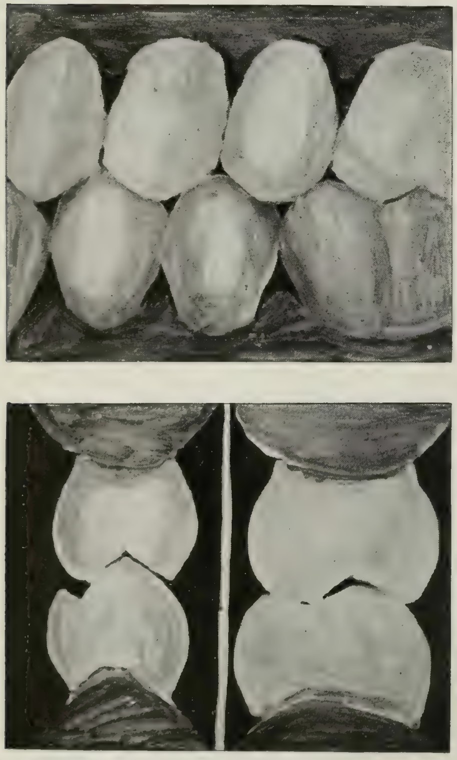
The production of a partial vacuum within the cranium while the bones are in the plastic stage of infancy, through the incorrect use of mechanical feeding appliances, reduces the dental arch and nares (see Fig. 2), distorting the nasal septum, etc. This and other resulting forms of irritation, adenoids, polypi, etc., promote finger-sucking, which also aids in the distortion, and the dental arch becomes constricted.

The third molars are intended to help receive the stress of mastication—which would otherwise be brought to bear on the synovial membrane of the temporomandibular articulation—thus avoiding joint diseases, clicking, dislocations, and other articular irritations. (See Fig. 3.)

The molar cusps are so shaped that in

grinding the food, when the occlusion is as originally designed, these cusps will meet the cusps of the occluding teeth in such a manner that the front teeth are raised over their antagonists by the undulatory motion thus given to the mandible. This protects the anterior teeth from wear, fracture, and lateral pressure, which might result in infected pulps, and the last one, lateral pressure, in that dread condition known as pyorrhea; for lateral pressure, often due (Fig. 4) to the loss of one or more molar cusps, causes pinching, irritation, and also impairment of the blood supply of the pericemental membrane, where the forerunners of pyorrhea first get a foothold.

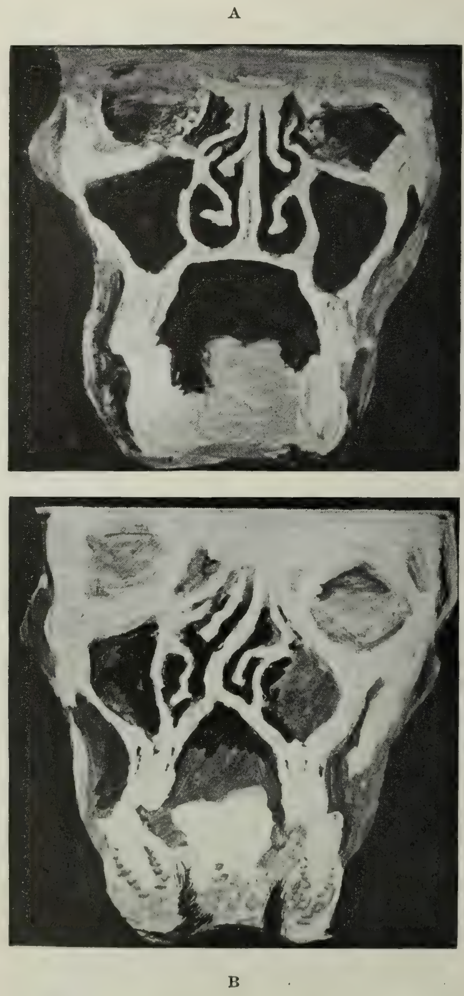
Fig. 1.



To prevent lateral pressure, which causes approximal caries and destruction of the pericementum, and to prevent tilting, which causes inflammation of the pulp and pericementum, the teeth should occlude as designed by nature.

The occlusal surfaces of the molar teeth are so arranged that in withdrawing them from soft foods in the act of mastication, saliva ejected from the ducts beside them is drawn into the food and on to the concave surfaces of the teeth, in order that when the mouth is closed again it may be pressed through the food. If one multiplies the area of a tooth by the number of times the teeth are

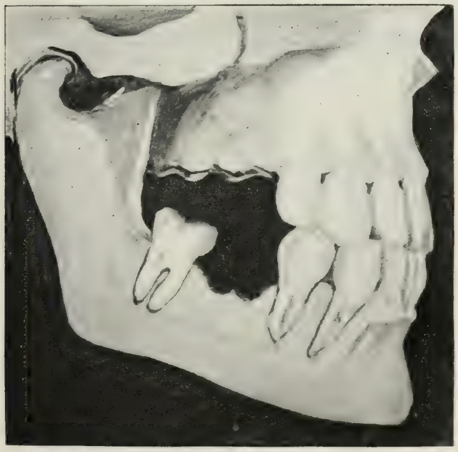
Fig. 2.



A, Normal arch. B, Constricted arch.

brought together in mastication the loss of one tooth is appreciable. Furthermore, the trifacial nerve is one of the most influential and sensitive nerves in the human economy, and continued irritation of it will cause serious harm. The sources of such irritations (pulp stones, pericementitis, pulpitis, etc.) often result from the loss of one tooth. A most serious result is too much pressure on the inferior dental branch of this nerve by the conical roots of the anterior teeth when the molar teeth have been lost. (See Fig. 3.) This causes various nervous disorders similar to those produced by impeded eruption of the teeth in childhood—not so violent but of longer duration, and often with quite serious consequences.

FIG. 3.

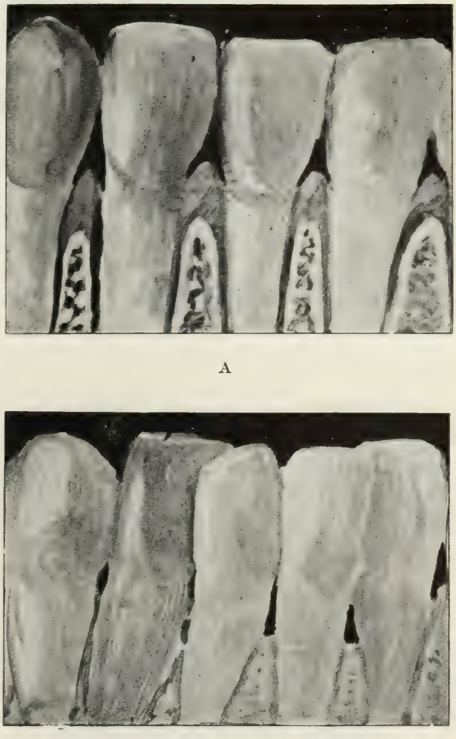


I have mentioned these reasons why the third molar should be preserved if possible, because it is considered the least consequential of the teeth. On them depend personal appearance, resonance of voice, unimpaired respiration, efficient mastication, hygienic preservation; in fact, appearance, facility of expression, health, and even length of life.

NEEDLESS EXTRACTION OF TEETH WHICH MIGHT HAVE BEEN SAVED.

I am opposed to the extraction of teeth based on pathologic and radiographic evidence, if it be done without considering the other conditions existing, and those that might follow; without attempting to cure these infections locally, not even investigating to see if this can be done; without attempting to find and correct the original cause of these fistulæ or rarefied areas, and without realizing the inestimable value of each tooth, and going seriously into every detail of saving it. I wish our research departments would find out for us how to make it possible for bone to grow back into rarefied areas, so that we could crown the old roots instead of extracting them, rather than devote their time to working out problems that do not so vitally concern us.

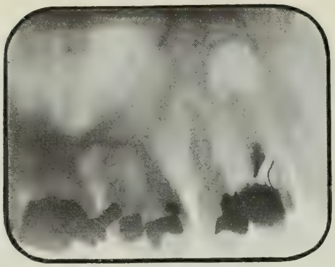
FIG. 4.



A, Normal blood supply. B, Impaired blood supply due to crowding.

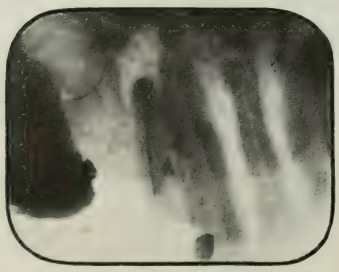
I have seen teeth condemned to extraction when the judge thereof did not know what kind of micro-organisms were in the infected areas, and when he could not prove that their products were actually harming the supposed sufferer. I have heard it proclaimed from the stage of research that the germs from these areas were causing lesions of the heart valves, appendicitis, rheumatism, arthritis, neuritis, etc., when no proof was offered that there were no other sources of infection present. And I have seen such statements illustrated by radiographs in which the dental work was simply atrocious. It was this faulty dentistry that needed correction, the removal of the primary causes of irritation, after which nature could correct the condition just as she does in other regions of the body.

Fig. 5.



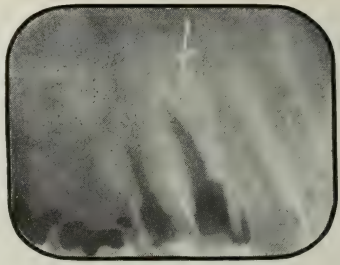
Rarefied area on first bicuspid roots; cement part way in canals; puncture where wire points mesially.

Fig. 7.



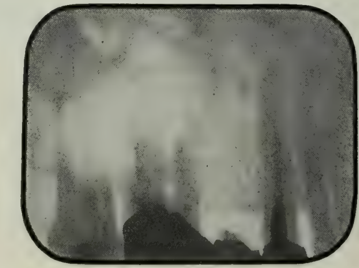
The upper first bicuspid shown in Fig. 5 was condemned to extraction, and the radiograph showed a large rarefied area. If it had been extracted the dentist could have shown the patient an abscess sac clinging to the root, and could have felt great satisfaction at having successfully removed it; and if he had been familiar with the teachings of the present time he could have recounted all the terrible disasters he had prevented. But besides the other functions that made this tooth valuable, it contributed to the patient's appearance and articulation, and she did not wish to lose it. This condition had existed between eight and ten years, and besides a slight soreness of the tooth there had been no discomfort until a dentist in endeavoring to reach the abscess tract through the root punctured the side of the root. One can see that the original trouble came from faulty dentistry, the roots having been filled only part way, and that by cement. It would be wrong to extract this tooth from the evidence in this picture. The acute trouble which brought the patient to me was caused in an attempt to open the

Fig. 6.



Arrow shows position of former rarefied area shown in Fig. 5.

Fig. 8.



Bicuspid shown in Fig. 7 supporting bridge.

root-canals. When access was had to the canals and the cause of the abscess removed, by keeping an open drainage the pericementum gradually came back to its natural position, and the fibrous tissue, and afterward bone, filled in behind it (Fig. 6). Figs. 7 and 8 show another bicuspid, and Figs. 9, 10, and 11 a central incisor, around which bone has filled in.

Fig. 9.

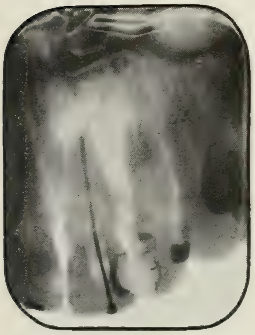


Fig. 10.

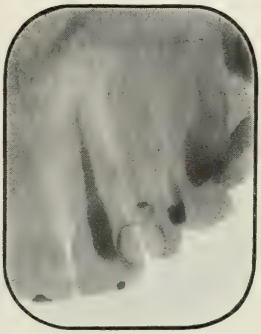


Fig. 10: Proper filling of Fig. 9.

Fig. 11.

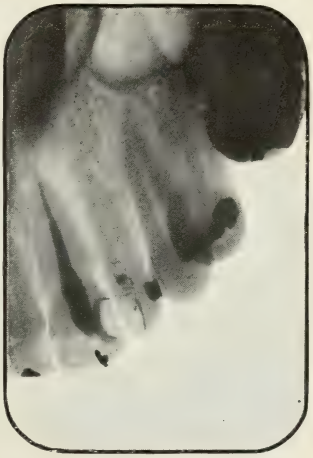


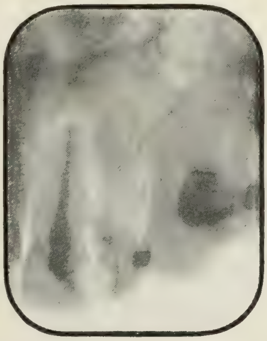
Fig. 11: Bone beginning to fill in.

Because of the responsibility placed on the dentist for disasters from infection, because some authorities have foolishly said that every devitalized tooth should be extracted, we must redouble our former care and caution in this branch of our work, for it is possible to achieve success with zealous effort. The main object should be to so treat a root that there will be no danger of systemic poisoning following the operation, and not to see how much of the crown we can leave intact.

PRELIMINARY STEPS TO ROOT-CANAL TREATMENT.

In opening a tooth preparatory to root-canal operation the following steps are essential: (1) Determine which tooth is to be operated upon; (2) recall a mental picture of the normal anatomical shape of the pulp chamber and positions of the root-canal openings of this particular tooth; (3) with a radiograph or careful physical examination determine the number and probable directions of the roots, and then call to mind all the irregularities to which such a tooth might be subject; (4) open the crown until the entire floor of the pulp chamber is visible, and then do not take it for granted that the canals are in normal positions, but look for possible irregularities; (5) locate each canal; (6) proceed to open the tooth in such a manner that the roots can be effectively cleaned. If the drill or broach

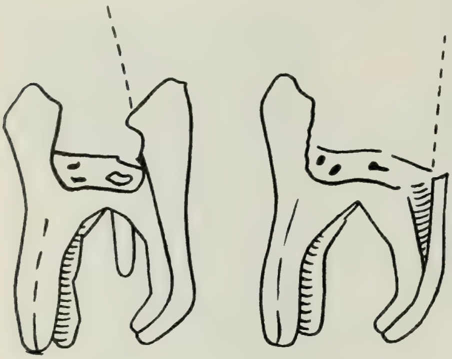
Fig. 12.



Shows almost all bone filled in.

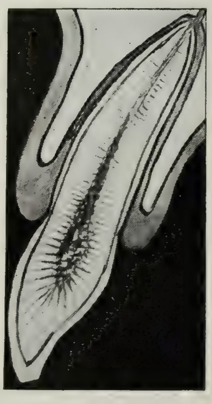
binds on the walls of the canal before you have penetrated half-way to the apex (see Fig. 13), stop, and open up the crown of the tooth, as you cannot clean a canal with a broach or bristle unless the canal is sufficiently enlarged. The inner part of a root is soft, and contributes little strength. It is cancellated, and full of organic matter. (See Fig. 14.) Do not attempt to remove this cancellated structure by strong drugs, or to convert it into harmless tissue, but remove as much of it as possible. If the canal is but little larger than the point entering it the material it contains is simply pushed toward the apex, and remains there. It often affords the operator a feeling of satisfaction to get the broach around a curve, and he frequently transmits his satisfaction to the patient, but in reality very little cleaning can be done in a root that is difficult of access. In a case recently treated, while following these rules, I opened the crown of a fistulous upper first molar, in which I could already see three root-canal openings. (See Fig. 13.) Before proceeding farther I opened the tooth until the entire floor of the pulp chamber was visible according to these rules, and toward the lingual edge was another opening. This canal had been missed entirely, and was full of putrescent matter, and pus from the tooth had been discharging for a number of years. I found that what had been considered the palatal root-canal was a puncture which had been filled with gutta-percha. It was just in the normal position of a lingual root, and was no doubt the result of proceeding with the supposed knowledge of where that root-canal ought to be. These are the cases in which most punctures of the floor of the pulp chamber occur; the puncture is made where the canal opening might have been expected to be found, when in reality it was somewhere else, usually under an overhanging wall of the pulp chamber.

Fig. 13.



We have perhaps been treating and filling root-canals in the wrong way. The successful treatment of the canal does not now seem to depend on the kind of drugs used, but upon the *way* in which they are used, and the successful result after filling does not depend on the kind of filling material used, but upon the method of its introduction. But the finding and cleansing of the canals, about which usually not so much is said, demand the most exacting technique.

Fig. 14.



The tubules opening from the pulp are quite large (25 microns), diminishing as they approach the periphery.

It is necessary in these days of superactivity to have a system for every possible procedure, and in order to systematize root-canal operations I adopted in my practice the principle of encapsulation of the root as a guide. The aim to be kept in mind is to avoid any act that will irritate or destroy the first tissue that forms across the apical foramen when the nerve filaments and bloodvessels are removed or atrophied.

NATURAL ENCAPSULATION OF THE ROOT APEX.

To induce a little tissue to cover the apical foramen when the purpose of its existence has ceased, and to close the opening, usually infinitesimal, where the nerve and blood supply once entered the tooth, is a very simple affair, for the restorative functions of the pericementum are ready to do this for you. But to clean the root-canal in such a manner as will not make this primary encapsulation impossible, or to further treat and finally fill this root-canal in such a way that this process of encapsulation is not interfered with in its formative stages, are operations exacting in each detail.

Fig. 15.

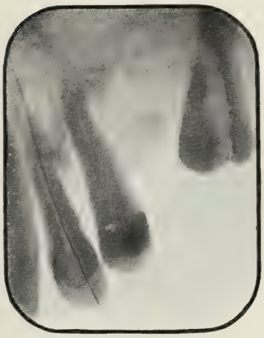


Fig. 16.

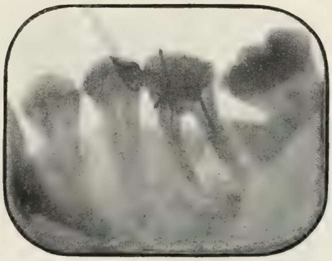
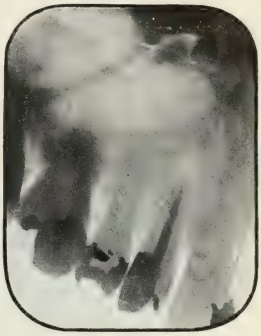


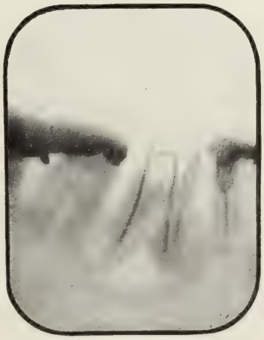
Fig. 17.



Encapsulation of the apex explains the durability of certain cotton and other forms of root filling long after the virtue of their medication has departed. It also explains nature's tolerance of putrescent root-canals that give no trouble as long as the gases find other exit, and do not interfere with the apical encapsulation; of teeth devitalized by concussion that cause no discomfort, and insures the permanent success of surgically correct treatment and filling of root-canals.

Radiographs are indispensable in expert root-canal treatment and filling. They can be completed in less than ten minutes, and save many hours. The operator should not attempt to discover the length of the root by prodding the apical tissue with a broach to see if he can feel the end of the root or produce sensation outside of the foramen. Sometimes a small amount of partly desensitized tissue in an unusually long root may seem to indicate that the apex is reached; sometimes in a short root with a large apical foramen the sensations seem to indicate that there is more pulp remaining, and damage may be done to the tissue outside. But the radiograph discloses these conditions; it sometimes shows unsuspected curves and supernumerary roots, and with its aid the proper length and shape of the filling may be determined. (See Figs. 15, 16, and 17.)

Fig. 18.

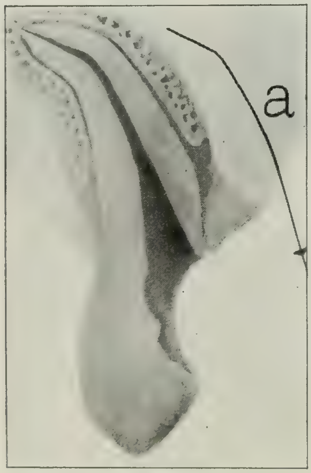


The tooth should be opened, and a

radiograph made as soon as it is possible to insert a wire or gutta-percha point in each canal. (See Fig. 18.) By comparing the actual length of the wire with the length as it appears in the picture, the exact amount of distortion of the root and its real length can be determined; this is marked on a fine steel bristle with sticky-wax, and kept for reference. (See Fig. 19.)

Proper drainage is absolutely necessary to establish the primary encapsulation; the secondary encapsulation comes with the formation of fibrous tissue and bone.

FIG. 19.



The classification of conditions determining the method of procedure is as follows:

CONDITIONS WHICH MAY INTERFERE WITH ENCAPSULATION OF THE ROOT.

There are five conditions that may interfere with the encapsulation of a root:

(*a*) Infections from unsterilized instruments, or from instruments that have been sterilized but have touched the bracket, the lips, or adjacent teeth before being inserted into the root-canal, or that have passed through the septic matter remaining in the root-canal, or from proliferation and growth through the apex of germs remaining in the root-canal.

(*b*) Pressure necrosis from gases forming in the pulp chamber that have not sufficient external exit, or from compressed air under temporary fillings.

(*c*) Eschars from strong drugs forced through the apical foramen by packing the dressings too tightly.

(*d*) Too short a root-filling, permitting space for serum to collect and decompose within the root-canal.

(*e*) Too long a root-filling, a broken-off instrument point, or other projection causing irritation of the tissues beyond the apical foramen, and permanent interference with the formation of the capsule.

CONDITIONS DETERMINING METHOD OF TREATMENT.

Having in mind the object to be attained, encapsulation of the apex, and these five conditions that may interfere with it, we shall next determine the course of procedure to be employed during the operation.

There are five conditions here also that determine the differences that should be made in the methods of treatment: (I) Exposed pulp with no infection. (II) Exposed pulp with infection not reaching the apex. (III) Root infection extending beyond the apex, with the pericementum not involved. This class has three subdivisions, to be mentioned later. (IV) Root infection with destruction of the pericementum about the apex. (V) Miscellaneous conditions, less frequently met with.

When a tooth is presented to us for treatment, we may determine, first, under which of these classes (as denoted by numbers) it comes; then we follow the course of procedure indicated in that class for inducing the encapsulation of the root, bearing in mind and avoiding the five conditions (as denoted by letters) that interfere with this process.

TECHNIQUE OF TREATMENT OF THE FIVE CLASSES OF ROOT-CANAL CONDITIONS.

We shall consider in turn the variations in treatment determined by these different conditions, our purpose being to induce encapsulation of the apex, and our technique being devised to guard against the five different errors that would defeat this object.

CLASS I: EXPOSED PULP WITH NO INFECTION.

Removal of the pulp. When a pulp is unexpectedly exposed, or must be removed for one reason or another, a desirable method for removing it is under cocain pressure anesthesia. To make an exposure when none occurs I prefer to do this under nitrous oxid and oxygen, cutting quickly with a new bur until slight bleeding is obtained. While the patient is still partially anesthetized the cocain is applied on a small cone of soft gutta-percha attached to a suitably shaped instrument. (See Fig. 20.) The point of the cone is softened with heat, and a few crystals picked up, which are thus easily applied to the exposure, the bulk of gutta-percha of the cone preventing leakage, and insuring pressure. This is done just as the analgesia stage is reached, twenty to forty seconds after beginning the administration; the nitrous oxid is then shut off, and a few inhalations of oxygen are allowed, during which the broach is inserted and the pulp removed. If there is any doubt about the root being normal, a preliminary radiograph should be made, showing any irregularities of the roots. When the curve in a root, as disclosed by the radiograph (see Fig. 19), makes access to the apex impossible or difficult through the ordinary opening, the tooth should be cut in such a direction that access may be gained. If the curve in the root is so great that the apex cannot be reached even when the opening has been brought to the gingival line, the remaining portion of the root beyond the curve must be treated by means of a steel bristle, bent as indicated by the radiograph (see Fig. 19), or a fine silver probe, with certain preservative medicaments.

FIG. 20.

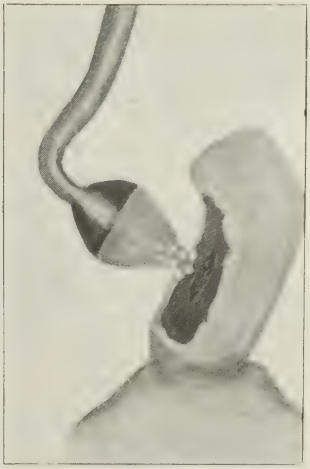
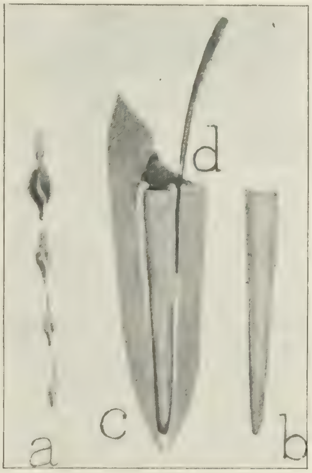


FIG. 21.



The space between root-filling and apex is exaggerated to show how the cold end of the gutta-percha prevents pressure of the zinc oxid paste with which the space is filled. Encapsulation then seals the apical end of the root, the other end being sealed by the process described.

ENLARGING THE CANALS.

As soon as the pulp is removed the canal is enlarged by means of root-canal drills. For this I prefer the Gates-Glidden type as being best adapted to following the canal and removing the cuttings. It is best to enlarge the canal at once (see Fig. 21) to the size desired for the filling, using the largest drill first, so that more room is made available for the work to follow, then the drill next in size, then the third, and finally the fourth is used. This procedure is for the purpose of enlarging the canal, but should not be carried to the apex except in most favorable cases. The drills used should be round-pointed so that the walls of the canal may not be cut into—for absolute smoothness is necessary—and flexible, for following the curves. The operator's touch must be light and skilful, and everything entering the root-canal aseptic. The technique of successful root-canal treatment and filling is as exacting and should be as expertly performed as a similar procedure in any science *where one moment of indifference may cause failure in the result.* Any portion of the root that cannot be safely reached with a drill is cleaned as well as possible with broaches or by other methods suitable to the individual operator.

INDUCING NATURAL ENCAPSULATION OF THE ROOT APEX.

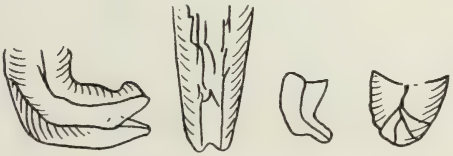
When a pulp where there has been no infection, as in class I cases, has been removed, the uniting of the tissue across the apex is ready to begin at once, and by the careful application of the first three of the conditions designated by the letters *a, b,* and *c* no interference with this process occurs. To avoid condition *a,* we make sure that all instruments to be used and the field of operation have been made absolutely aseptic. To avoid condition *b,* which in this case would usually be from compressed air, we enlarge the root-canal, make it uniform in taper, and remove all accessible remaining organic matter mechanically and with hydrogen dioxid, which enables us to insert the root-canal dressing and temporary filling in such a manner that no air remains in the root-canal. This is effected in two ways—by causing the temporary filling to adhere to one side of the canal or cavity, and then spreading it sidewise instead of pushing it straight in, and also by piercing the temporary filling with a fine steel bristle after insertion. Sometimes, when this latter method is employed close observation will reveal a tiny bit of the antiseptic medicament from the dressing oozing from the bristle hole, showing release of pressure from within that would have been exerted on the apical area. To avoid condition *c* we refrain by the aid of the radiograph from enlarging the apical foramen, and use on the root-canal dressing liquor antisepticus or an equally mild substitute. The cotton or other substance carrying it is relieved of all excess of liquid before insertion, and the same method of placing the temporary filling is observed as in condition *b.* The use of strong antiseptics such as formaldehyd, creasote, tricresol, carbolic acid, sodium dioxid, or any irritating or escharotic drugs is avoided, as they would interfere with the restorative processes in any wound, and are not indicated where there is no infection. The other two conditions, *d* and *e,* refer only to the operation of filling.

MEDICATION OF THE CANAL.

With the above procedures faithfully carried out, the next day, or the following one, when the dressing is removed, the cotton will be found to be white, dry, and odorless, the small amount of liquor antisepticus, boric acid solution, or whatever mild antiseptic was used having been absorbed. It is better not to use an aromatic susbtance, as it interferes with detecting the presence of any undesirable odor in the root-canals. In some cases I have abandoned the use of a cotton dressing, simply painting or swabbing the inside of the canal with the antiseptic.

When one considers the manifold irregularities occurring at the apical foramina (Fig. 22), it is apparent that attempts to hermetically seal these root-canals by any particular material or method will be futile, and when one considers the infinitesimal organisms against which these fillings are supposed to protect the root-canals, hermetically sealing a root by any mechanical process whatever is out of the question. Radiographs may show some of these branching canals apparently filled, but they would have to be magnified 1200 diameters to prove that any of the thousands of tubuli were *not unfilled,* or that at the ends there was hermetical sealing against pathogenic micro-organisms. Furthermore, the pressure necessary to force filling material into some of these small canals would be one of the contributing factors in the larger canals of starting a blind abscess or other conditions of pressure necrosis which make the tissues *receptive to future infection,* and would be disastrous to necessary formation of tissue about the apex, where the blood and nerve supply enters the tooth. When these vessels and nerves atrophy at the apex the surrounding tissue must join, which is the natural encapsulation of the apex. No root can be sound that is not hermetically sealed, but that result is accomplished by organic activity or "nature," in the same manner as a bullet or other foreign substance is often encapsulated. In the case of a minute canal such an encapsulation is to the eye quite small, though really taking hundreds of cells to span the distance. In the case of an amputated root this distance is quite considerable.

FIG. 22.



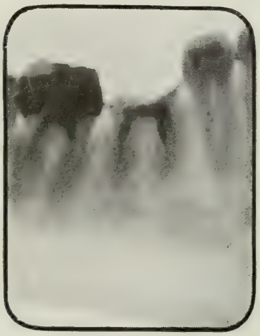
In favorable cases, where the occasion demands it, the root in a class I case may be filled at the same sitting at which the pulp is removed. Or it may better be done on the following day, when the interior condition has been satisfactorily proved, and the encapsulation has begun. After encapsulation takes place, or if the conditions making it possible are preserved, it makes no difference what the root is filled with, provided this encapsulation tissue is not *afterward disturbed,* and for this purpose the conditions to be avoided were noted, and the technique of placing the root-canal filling which I am about to describe was designed.

TECHNIQUE OF FILLING THE CANAL.

A root-canal filling should be easy to insert, easy to remove, antiseptic, and secure against infection from the oral cavity. (See Fig. 21.) The gutta-percha cone used when making the radiograph, or, if no radiograph was taken, a cone similar in shape to the canal to be filled, is prepared and washed in alcohol. This shape is determined by the radiograph, or if no radiograph is available, by the extent of penetration and size of the instruments used for cleaning and enlarging the canals, and by the anatomical conditions. The gutta-percha cone is tried in the enlarged root-canal and fitted so that its apex binds in the root-canal as near as is safe to the foramen in small canals and just to the foramen in large ones. This is to stop its further progress when inserting it and thus prevent any chance of producing pressure or protrusion outside the apex, either of which may irritate the tissue and cause pathological conditions. I have never yet seen a case of alveolar abscess in which there was not a necrosed area outside the apex with an open connection between the offending root and the abscess tract or fistula, which means that there is no encapsulation; the same conditions that prevented the formation of tissue over the apex are always responsible for the formation of the abscess. When we are unable to avoid these conditions the abscess sometimes spreads quite a distance in the pericementum, denuding the whole apical end, which could not occur if the original conditions had been such that the membrane had united over the apex.

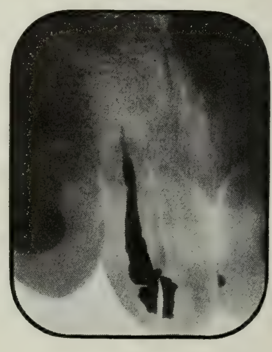
When the gutta-percha cone is prepared, a fine broach or bristle marked to show the length of the root is (see Fig. 19) loaded with a prepared antiseptic paste. This paste is pumped into the canal in such a manner as to cover the entire inside of the canal, and the instrument manipulated with such restraint that its point never penetrates the apex. The almost irresistible impulse to keep on pushing any fine instrument up a root-canal until something stops it or the patient feels it *must be overcome, and the mark on the bristle strictly adhered to,* for the cases where nothing can be felt with the instrument and the temptation to press on is greatest are the ones with large foramina; these are the most likely to give trouble if irritated, and are the most difficult in which to induce encapsulation afterward. If it is not possible to get a radiograph measurement, and if sounding must be resorted to, *be sure to do it with a sterile instrument just after the pulp is removed, and before any restorative activity has begun.* Then, by carefully preserving this measurement, the treatments and filling can be carried on without again disturbing the tissue at the apex. Any antiseptic paste or material that will remain moist long enough, and will not set too hard afterward, will answer for this method of filling. I use zinc oxid, subnitrate of bismuth, and iodoform, mixed with very little creasote, which is about the same thing. This paste will show distinctly in the radiograph, though it is not necessary to see the permanent filling unless there is trouble, for the most important time to have the radiograph is before the filling is permanently inserted, and the principal point to observe afterward is the condition of the tissues beyond the apex. If these tissues are normal, but the filling appears to reach only part of the way and the physical conditions are normal, the tooth is sound (Fig. 23), as is the case in nine-tenths of the fillings of lower molar teeth having two mesial canals, or upper molars with two buccal roots. But if the structures beyond the apex show a pathological condition, even though the filling appears to reach the apex or protrude through it (see Fig. 24), as some teachers advocate, the tooth is not sound; so that in reading a film these structures outside the root alone are diagnostic of the condition of the root-canal, and the picture of the filling proves nothing except whether or not the root is filled to the apex, and it is very much like making photomicrographs of pathological conditions in amplifications too low to show micro-organisms—satisfying from an artistic standpoint, but unscientific. Let me repeat that sealing a root against micro-organisms—filling multiple foramina and tubuli by pressure—cannot be scientifically demonstrated with radiographs.

Fig. 23.



Root-canals filled part way twenty years ago. The first molar now supports a porcelain crown.

Fig. 24.



When the paste is in place the gutta-percha cone is slowly pushed in (Fig. 21), allowing the paste to flow out around it, so that when its apex is engaged and its progress stopped by the walls of the canal it lies in the position it was designed to occupy, embedded evenly in the paste, with no pressure. The pulpal half of the gutta-percha cone is then softened with warm air or a root-canal drier, while the apical half remains cold. The softened end is then spread out against the walls of the canal, while the cold and therefore hard end within prevents pressure on the apical area. All excess of the paste outside of the gutta-percha is removed, and the canal and top of the gutta-percha cone washed with alcohol until no external trace of the paste remains. The gutta-percha is then sealed at its edges to the canal walls with a heated blunt-pointed instrument (Fig. 21), and the root is ready for whatever restoration is indicated.

Applying to this filling procedure the five conditions that may prevent encapsulation of the apex, we have avoided the infections that may occur under *a*. In division *b* we have guarded against leaving any tissues in the canal that might subsequently accommodate gas-producing germs, and we have avoided inclosing compressed air in the root-canal. In *c* we have, by noting measurements of the root, carried no drugs beyond the apex, and have avoided such pressure as would force them through the foramen; nor have we enlarged the foramen, thus avoiding an eschar outside the root. Regarding *d* and *e:* By placing the cold gutta-percha point in the root with an exact knowledge of the length of the root and the point, we know that there has not been too much discrepancy in the length of the filling nor a projection of the filling outside of the root.

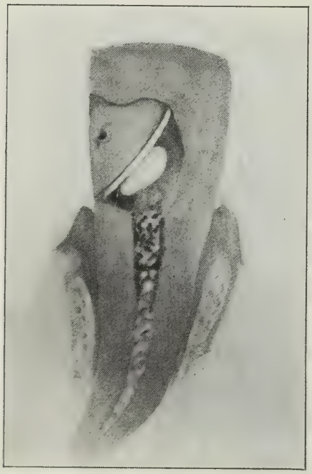
Having thus systematically and scientifically completed our operation, we have the satisfaction of knowing that we have not relied upon chance or experiment or the healthy organic nature of the patient, but have accomplished a scientific operation of assured success.

If success does not follow, *and our technique was not at fault,* we know that the case is not normal. We then proceed to the next step—autogenous vaccine. If this is unavailable or the result is not satisfactory we proceed to the next step, which is to curet the tissues about the apex, removing all hardened pus and necrosed matter that the system could not absorb. If this does not produce the desired result we know that the dentin is infected to such an extent that the preliminary covering of cells necessary to its encapsulation cannot take place, on account of the enzymes liberated by these cells as they are destroyed, and so we must proceed to the next step, which is amputation of the diseased portion of the root. Sometimes it is necessary to remove the entire root in a multiple-rooted tooth. If amputation of the apex properly done, with the root correctly filled and clean dentin presented for encapsulation, and with the proper antiseptic drainage maintained, does not result in successful restoration of the periapical tissue we know that the tooth must be removed—and we are following a definite system in which there is no hesitation or experiment, and whose last resource is the extraction of the tooth.

CLASS II: EXPOSED PULP WITH INFECTION NOT REACHING THE APEX.

The second condition determining the method of procedure in the treatment and filling of root-canals involves cases where the pulp is exposed and infected, the infection not having reached the apex. A growth of micro-organisms, the presence of their products, the disintegration of the pulp tissues, and the attendant congestion of the bloodvessels, all unite to prevent the absorption of cocain, so that an attempt at pressure anesthesia may be dangerous, and extremely painful. In this case anesthesia with nitrous oxid and oxygen is carried to the point of unconsciousness. The five conditions (represented by the lettered divisions) unfavorable to encapsulation being carefully observed by the operator throughout the operation, the pulp is removed just as complete anesthesia is reached; at the same time the oxygen is increased. The removal of the pulp in most cases is in this manner accomplished with no pain or inconvenience to the patient, and with no danger of forcing the infection to the apical area, which is sometimes the case when pressure anesthesia is used. A radiograph is made of the case to disclose the necessary conditions and measurements, or they are otherwise determined as mentioned under class I. The most important of the five conditions to be guarded against in this class is found in the first, or division *a*, viz, the danger of carrying the infection in the pulp to the apex by means of instruments used in removing the pulp, and in the subsequent preparation of the root-canal. This is guarded against by having limit marks on all the broaches and bristles determined with the aid of a preliminary radiograph before the patient is anesthetized, thus enabling the operator to so control them that they will always fall short of the apex, or if a radiograph is not possible, to be very careful not to enter the full extent of the root. As soon as the pulp is removed, the root-canal is sterilized to the apex, so that any remaining infection is destroyed. It is even better in this class, when the condition permits delay, to prepare the tooth the day before the operation is made, by placing a cotton pellet containing a penetrating germicide—that is, one that will not cause too much coagulation of the tissue—loosely against the exposure. (See Fig. 25.) This cotton pellet containing the germicide should be protected from pressure with a piece of thin metal plate sealed in with gutta-percha. A hole is punched in the plate and a bristle or wire inserted touching the cotton pellet, around which the gutta-percha is packed, so that, when the bristle is withdrawn, an escape for any gases from the pulp is afforded, while any infection entering from the mouth is rendered harmless by the sterilizing agent on the cotton pellet. Thus the conditions noted under *b* and *c* are avoided. In the few cases in this class which do not take kindly to nasal inhalations, either owing to chronic mouth-breathing or nervousness, the pulps may be devitalized with one of the preparations of arsenic, always under protection of a metal plate to prevent pressure. When the pulp is removed and the canal enlarged and sterilized and a dressing inserted, the operation of root-filling is completed later, as described in class I, as soon as the appearance and conditions of the root are favorable.

Fig. 25.



CLASS III: ROOT INFECTIONS EXTENDING BEYOND THE APEX WITH THE PERICEMENTUM NOT INVOLVED.

This class is divided into three subdivisions: (1) Those with no pus present; (2) those in which the formation of pus has begun, and (3) those in which pus is present with a fistulous opening.

(1) *No pus present.* The pulp being destroyed by bacterial action, there is no need of an anesthetic in any subdivision of this class. A radiograph is first made. The canal is cleaned with no attempt to go beyond the apex, and every precaution is taken to avoid carrying any of the matter within the tooth through the apical foramen. When the root is thoroughly cleaned and the canal properly enlarged a cotton dressing twisted on a bristle is made, and being saturated with a non-coagulating and sufficiently permanent antiseptic, is inserted so that it will reach as near to the apex as possible. This dressing must not be packed in, but

lie loosely along the root-canal, thus avoiding the danger of eschars from too strong drugs being forced through the apex as noted in division *c*. A pellet of loose cotton is next placed in the pulp chamber, touching the end of the root-canal dressing, and taking up any of the excess antiseptic that may have flowed down from it. A valve is then made with a thin metal plate under which is placed a small pellet of cotton containing a germicide, as described in class II, permitting any pressure from drainage within to escape, but no infection from the mouth to enter. This dressing is allowed to remain for a week or more unless the demand for drainage is continued longer. The root may then be prepared for filling, with no danger of adding to the infection beyond the apex—which will usually have been removed by absorption, since the source of its activity is gone—and the filling may be inserted as before described.

(2) *Pus present or about to form.* Cases coming under this subdivision are generally attended with severe pain, and it is usually necessary to alleviate this before root-canal treatment can be instituted. If pus is present the root-canal is sterilized, and if safe an opening is made through the apex. This drainage gives relief. If the inflammation is too great to admit of opening the apex, or if the pus has not sufficiently formed, or if the apex is inaccessible and the pain is severe, everything must be abandoned to lessening the pain. Morphin, $\frac{1}{8}$ grain, injected near the tooth in a receptive portion of the gums—often accomplished in thirty seconds with nitrous oxid—followed by proper poulticing and systemic treatment will most quickly alleviate the pain. Sterilizing agents or strong antiseptics or oxidizers are contra-indicated in the cancellated structure outside the apex. The pus tract, after having been evacuated, is washed with an antiseptic (such as liquor antisepticus) just strong enough to *inhibit* bacterial proliferation. As long as pus or blood is present, complete drainage must be maintained; even a cotton dressing will sometimes cause too much obstruction. When healing is beginning, a watery serum appears. A root-dressing is then made, similar to the one described under subdivision I, because of the open apex containing the mild antiseptic just mentioned for washing out the pus tract. The pellet of cotton in the pulp chamber beneath the valve may be saturated with a stronger antiseptic or germicide to destroy any infection which may enter from the mouth. (See Fig. 25.) This dressing must be changed every day for the first week, and for the remaining two weeks should be changed according to the indications given by the drainage on the cotton dressings. It requires about three weeks for the destroyed area outside the apex to be filled up with fibrous tissue, in which ossification afterward may or may not occur. If the root below is sealed, the drainage from the process of repair will back up and prevent its progress. When there is no further need of drainage, the root-filling is inserted as described before.

(3) *Involvement of the tissue beyond the apex with fistulous opening.* All traces of septic matter must first be removed from the root-canal and the canal thoroughly sterilized; the apex is in very few cases to be opened, but the fistulous tract should be well flushed from the outside with a mild antiseptic. It is not necessary to force liquids, however mild, through the root-canal and out of the fistula. The tract should be washed out every day if possible, and in the meantime a loose cotton dressing containing a mild antiseptic solution should be kept in the root-canal. As long as pus formation occurs the fistula will give it drainage. The dressing inserted in the root permits drainage of serum from the repair of the pericementum, so that the fistula and the apical tissue both heal up at nearly the same time, and when the fistula has entirely disappeared and the dressings within the root indicate no further need for drainage, the root-canal is filled. If the apex was opened, particular care should be taken (with the aid of the radiograph measurements) to have the end of the gutta-percha filling fill the enlarged foramen—*and without protrud-*

ing. In most cases where the apical end cannot be safely reached for treatment, and many chronic cases are of that kind, the root should be filled at once according to the method described. The fistulous tract will sometimes close of its own accord, and if it does not, the diseased areas should be curetted with a round engine bur and loosely packed with iodoform gauze. A few patients, however, object to the odor, and in such cases gauze dipped in liquor antisepticus may be used. If this is not successful autogenous vaccine or removal of the apex must be resorted to.

FIG. 26.

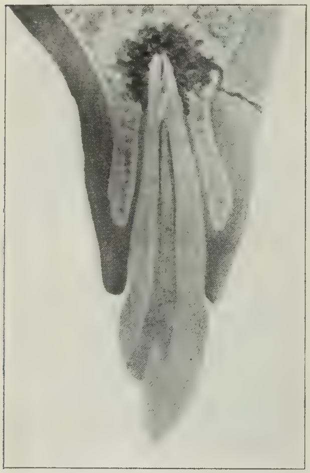
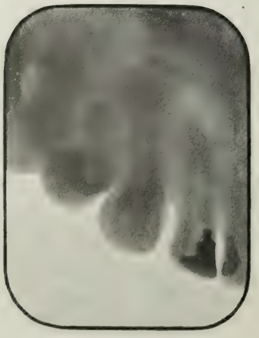


FIG. 27.

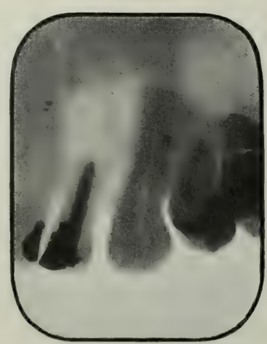


This lateral root went through all the stages to removal of the apex.

CLASS IV: ROOT INFECTION WITH DESTRUCTION OF THE PERICEMENTUM ABOUT THE APEX WITH CEMENTUM INVOLVED; ABSORPTION OF THE APEX; MULTIPLE FORAMINA.

This condition is usually not determinable by radiographs, but by failure of preceding attempts at curing the abscess. In such cases amputation of the apex must be resorted to before the flow of pus can be checked. In amputation of the apex, the root-canal filling is inserted prior to the operation. In these cases the gutta-percha cone (see Fig. 26) should bind closest at the point of excision, and no precautions need be taken with regard to the apical end. I use nitrous oxid and oxygen analgesia for this operation, cutting a single slit in the gums with a lancet, and then using a small dentate fissure bur to open the alveolar plate and excise the root. The use of the wire measurement enables one to cut directly through the root at the desired point without seeing the root or feeling for the abscess tract in the bone, which greatly facilitates the operation. After excision and cleansing I pack the wound with iodoform gauze, renewing it every day, or having the patient do so

FIG. 28.



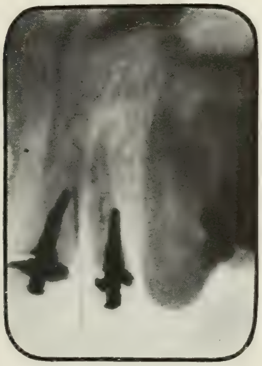
Removal of apex disclosed an abnormal condition, and cured the case shown in Fig. 27.

when possible. After the first week the gauze is decreased in size each day, until it is no longer necessary. (See Figs. 27 and 28.)

CLASS V: MISCELLANEOUS CONDITIONS LESS FREQUENTLY MET WITH.

(1) *Puncture of the wall of the root-canal.* I do not know of any case of puncture that has come to me for treatment in which the cavity was sufficiently enlarged to get access to the roots. This accident is the result of an undue valuation placed upon the crown of a tooth as compared with the root. It is better to cut down the crown to the gingival line than to risk causing an alveolar abscess, or puncturing the wall, or breaking off a piece of broach in a crooked canal, for the natural crown on a diseased root makes a very unsatisfactory comparison with a properly constructed porcelain restoration on a sound root.

FIG. 29.



Root-canal punctured owing to the supposition that it ran parallel to the adjoining teeth. The posts are supporting porcelain crowns.

In Fig. 29 is shown a case of punctured root. I formerly had considerable success in curing punctures by the use of platinum foil or gold castings held in place with cement. At the present time, however, I use a simpler and even more effective method. It consists in applying adrenalin to the tissue in the aperture (see Fig. 30, a) for about five minutes to check moisture; then placing a piece of paraffin of suitable size, and sterilized in 70 per cent. alcohol, against the exposed tissue. This is melted by touching with a warm instrument, when it adheres to the walls of the puncture and the dried tissue outside, and is followed as soon as it becomes cool with a layer of cement. The satisfaction to be had from this method is remarkable. Of course the further treatment of the tooth according to whatever class its condition places it in is quite as important, as the portion of the canal beyond the puncture (see Fig. 30, b) has usually never been cleaned, and will either prevent the healing of the punc-

FIG. 30.

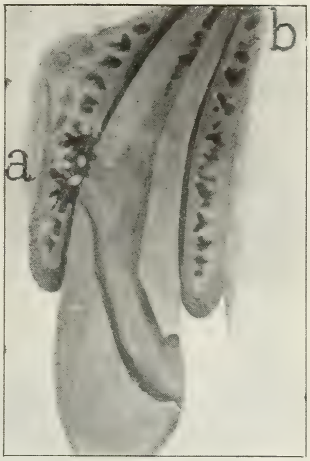
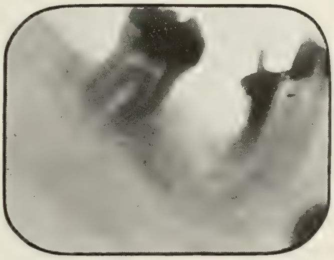


FIG. 31.



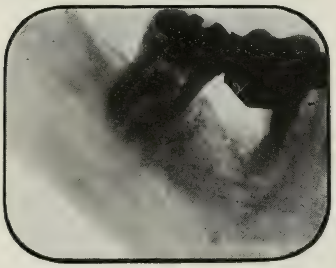
All of damaged first molar removed except mesial root.

ture or cause an alveolar abscess when the drainage afforded by the puncture is cut off. Figs. 5 and 6 show a cured puncture mesially in the first bicuspid, incidental to the root treatment.

(2) *Molars with one root hopelessly damaged need not be extracted.* (Fig. 31.) The entire offending root may be amputated and a restoration completed on the remaining one or two roots. (See Fig. 32.)

(3) *Teeth with roots difficult of access and with chronic conditions present sometimes require a long course of treatment.* Where the crown is badly damaged a gold casting is made to restore it, having a removable core, also of gold, held in with gutta-percha, and removable by heat. (Fig. 33.) Through this opening the root-canals may be treated, and the tooth structure, the gums, and adjoining teeth are not damaged by the use of gutta-percha. Also the natural shape and the relation with the other teeth are preserved during the period of treatment.

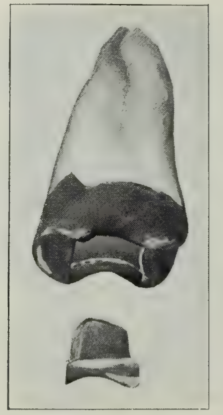
FIG. 32.



Removable bridge on root in Fig. 31, avoiding necessity of using second bicuspid by saving one root of a molar.

(4) *"Blind" abscesses, usually the result of pressure necrosis or an eschar.* A blind abscess differs from class III, subdivision 2, which is "an alveolar abscess with pus present and having no fistula," in that a fistula never forms from a blind abscess. A blind abscess, such as we sometimes find since using radiographs, is practically a cyst. It is inclosed in the membrane protecting the surrounding tissue from its contents, and is made possible because the patient has sufficient resistance to that particular form of infection to stop its proliferation. It is therefore probably harmless to the individual, while in the fistulous abscess the fistula is caused by the lack of resistance in an individual to the particular infection; the germs multiply, and pus and pressure soon effect an opening. The products from such a condition are toxic to an individual whose system could not originally inhibit the infection. When a root having a blind abscess is properly cleaned and filled according to the methods described the infectious material outside the root will usually be absorbed, the pericementum return to its normal position, and opening the apex is contraindicated. (See Figs. 5 and 6.)

FIG. 33.



In order to get the same angle in taking successive radiographs of a case, I use modeling compound softened in warm water so that it will adhere to the wrapper of the film. The film is then held in the desired position for the picture, and the opposing teeth pressed in the compound sufficiently to make a firm support when the modeling compound is cold. Additional films can be fastened to this mold at any time by slightly heating the compound in a small flame. In sending patients elsewhere for pictures the operator can thus indicate the angle desired, mark the median line on the compound, and send it with the patient.

CONCLUSION.

In conclusion, I would say that while this system seems involved and difficult to follow, nothing worth while in this world is accomplished without persistent application, and the man who is looking for easy methods is not apt to adopt the best ones in any department of life. Especially is this true of root-canal work, in which the utmost skill and finest technique—combined with acute attention to the varying conditions, and the rational use of therapeutic agents—are necessary to assure success, and in which failure with loss of the tooth is so disastrous and irreparable.

200 Pine st.

The Third Molar in the Evolution of the Jaw.

By JULIUS H. LEVINE, D.M D., Boston, Mass.

(Read before the Harriet N. Lowell Society of Dental Research of Harvard University, Boston, Mass., April 1913.)

DENTISTS in the past have had and dentists in the future will have the question of the extraction or preservation of third molars continuously before them. It was this question that stimulated me to study the history of the third molar. It is a matter of great regret that anthropologists, in making and caring for collections of skulls, have not paid more attention to saving the teeth in the dried skulls. In the great majority of the two thousand or more skulls which I have examined many of the teeth have been lost and the sockets destroyed, apparently from lack of care in handling or by failure to fasten them in when loose.

Human occlusion is the result of the successive adaptation of the animal dental system to the needs developing through the ages since the appearance of the first tooth in the fish; the farther we descend in the zoölogical scale the more uniform and simplified is the dental system. The latter is the more varied and specialized as we ascend the animal scale until we reach man, whose system is the most perfect as the result of adaptation, being composed of molars, bicuspids, canines, etc., a dental variety necessary for the purposes of an omnivorous animal.

FREQUENCY OF IMPACTED THIRD MOLARS.

The third molars in man today present an abnormal condition in a relatively large number of cases, being either malposed, impacted, undeveloped, or decayed. The doctrine of natural selection or survival of the fittest is as fully applicable to the teeth of an animal as to any part of its organization, and the operation of this natural law constantly tends to produce advantageous or "adaptive" differences. On the other hand, the strong power of inheritance is tending to preserve even that which, in the altering conditions of life, has become of very little use, and thus rudimentary teeth we may understand to be teeth which are in the process of disappearance, having ceased to be useful to their possessors, but which have for a long time lingered upon the scene. It must also be remembered that, just as natural selection brings an organ to its highest standard of efficiency, so the cessation of selection will tend to allow its variations in a downward direction to establish themselves. In other words, the continuance of that selection which elaborated an organ is required to maintain it at that standard. For the efficient action of natural selection, it will be seen that two conditions are essential; first, a competition among the organisms concerned, and second a tendency to vary, the variation being capable of being inherited. May not the third molar, then, be a rudimentary organ? And would it not be eliminated if the strong power of inheritance did not affect it, or if it had greater competition? Darwin, in his "Descent of Man," says; "It appears as if the posterior molars or wisdom teeth are tending to become rudimentary in the more civilized races of men. These teeth are rather smaller than the other molars, as is likewise the case with the corresponding teeth in the chimpanzee and orang; and they have two separate fangs. They do not cut though the gums till about the seventeenth year, and I have been assured that they are much more liable to decay and are earlier lost than the other teeth. In the Melanesian races, on the other hand, the wisdom teeth are usually furnished with three separate fangs, and are generally sound; they also differ less from the other molars in size than in the Caucasian races. Professor Schäffhausen accounts for this difference between the races by the 'posterior dental portion of the jaw being always shortened' in those who are civilized, and this shortening may, I presume, be attributed to civilized man's habitually feeding on soft cooked food, and thus using the jaws less. I am informed by Mr. Brace that it is becoming quite a common practice in the United States to remove some of the molar teeth of children, as the jaw does not grow large enough for the perfect development of the normal number."

It is a well-established fact that cases of impacted third molars have been and are still increasing in number. What is the reason for this? This brings us to the question as to whether the third molar will follow the course of the fourth molar, and ultimately disappear from the human jaw. In this paper I shall analyze the cause and manner of disappearance of the fourth molar, and see whether the same cause will produce the same results in the case of the third molar. Of course there is a new factor affecting the evolution of the jaws and teeth, which has to be considered in relation to the jaw, namely, the active interference of the dentist.

HISTORY OF THE FOURTH MOLAR.

"The earliest mammalian dentitions known to us carry us back no farther than mesozoic times, and of the mesozoic mammals we may say that they had mostly smooth cerebral hemispheres, no inflection of the angle of the lower jaw, and forty-four or more teeth. Of these the canines had two roots, and the premolars and molars were little differentiated from one another." (Tomes.)

"There is a definite relation in proportion of skull to dental arch in man as well as in lower mammals, and also in a number of groups of ungulates." (Osburn.) That is to say, a brachycephalic skull will have a short and wide arch, while a dolichocephalic skull will have a long and narrow arch. Now, as we study the mammalian scale we notice a gradual change from the dolichocephalic to the brachycephalic skull. We find in the higher apes a marked dolichocephalic type of skull. We find in the Australian skull, which is the most dolichocephalic in man, the longest, narrowest arch; in the negro, which is less so, the arch is a little more rounded. The Thibetan is moderately brachycephalic and the arch is rounded, while in the Mexican Indian, having the shortest skull, the dental arch is shortest and broadest. "It seems to be fairly well established that certain groups, such as the Fijian Kai-colos, Papuans, African negro, Arabs, and Eskimos, are usually dolichocephalic, and typical Negritos, the Mongoloid groups, and Lapps are brachycephalic, while the Malays and American Indians are mixed or mesocephalic." (Osburn.)

In the gradual change from the dolichocephalic to the brachycephalic skull we of course have a gradual shortening of the jaw. In saying that the jaws are becoming smaller, however, I ignore the rare condition of large jaw in the disease —acromegaly—of the enlargement of the pituitary body. This disease is very rare in America, but quite common in other countries. In going back from the brachycephalic to the dolichocephalic skull we get an increasingly prognathous jaw. The more prognathous the jaw, the more space we have for the teeth. In my examination of the two thousand or more skulls, I found that the more ancient the skull was, the more space there was behind the third molar and the less crowded were the teeth in general —that is, the interdental spaces were greater. I also found that the third molar was larger in older skulls than in the more recent skulls. In passing from the lowest order of mankind to the highest order of apes there is a somewhat sudden change in the character of dentition, and while it cannot but be admitted that there is a gap, the differences are all rather of degree than of kind. In some ancient apes I found an actual spacing of the teeth, which was of course very slight, and also enough space for a small fourth molar. You will now understand why cases of impaction of the third molar are increasing in number. The reason is that the jaw is becoming smaller at a more rapid rate than is proportional to either the decrease in the number of the teeth or in their size.

All these observations led me to believe that at one time some ancestor of man normally had four molars, and upon reviewing some literature upon the subject I learned the following:*

Orang.

Normal skulls observed, 52, with eight cases of fourth molars. One adult male skull had a fourth molar on both sides in the upper and on the left side in the lower jaw; in each case the fourth molar was smaller than the third; well formed, with four cusps, and the proper number of roots. On the right side of the lower jaw there was no fourth molar, but there was enough room for it.

Chimpanzee.

Normal adult skulls observed, 35.

Gorilla.

Normal adult skulls observed, 55, with four cases of fourth molars.

Old World Monkeys

other than anthropoid apes:

Cynocephalus porcarius: Fourth molar in upper jaw, space in lower.

Macacus rhesus: Fourth molar in right lower and in right upper jaw; the fourth molar was beneath the bone, and was only found by cutting away the neck of the maxilla by way of exploration.

New World Monkeys.

Cebus: Normal skulls observed, 66, with two cases of fourth molars.

Ateles: Normal skulls observed, 60, with three cases of fourth molars.

In skulls where the fourth molar was present, the third molar had its normal number of roots, which were not fused.

"The *Tenrec,* according to Mr. Oldfield Thomas, late in life cuts a small fourth molar; this, coupled with its tritubercular pattern of molar teeth, indicates great antiquity. Of living mammals only the marsupials and *Otocyon,* a doglike animal, have four true molars." (Tomes.)

Professor Ledouble of Tours declares that—"The evolution of the white man will produce the type in which the upper part of the head will be strongly developed, and the forehead will be broader and rounder. Owing to the fact that our food becomes increasingly easy to masticate, the human jawbone will diminish in size and strength, and the number of teeth will be reduced. Among the primitive races in Australia it is not uncommon to find natives with thirty-six teeth, but the white man of tomorrow will be fortunate if he has twenty-eight."

Dr. Miner told me of three cases of fourth molars in his practice, which he extracted, and found them to be normally developed, with fused roots.

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* "Material for the Study of Variation with Special Regard to Discontinuity in Origin in Species." By W. A. Bateson, M.A.

Let it be assumed that at some time man or a direct ancestor of man had four molars normally, in a very prognathous jaw. I say assumed, because, while we may believe in the doctrine of evolution, yet I do not believe it has been definitely proved to be a fact. Now let us trace the disappearance of the fourth molar.

WHY ORGANS WHICH CEASE TO FUNCTIONATE DISAPPEAR.

With the tendency of evolution to shorten the jaw, as we have already seen, complications arose. In the mandible the shortening of the jaw would result in pushing the fourth molar more directly underneath the temporo-mandibular articulation.

The nearer a tooth is to being directly underneath the joint the more horizontal is its movement in the opening and closing of the mouth, and therefore the less the space created between the upper and lower fourth molars. Now, remembering the bulky character of the food at the time of the existence of the fourth molar, you will readily see that this tooth ceased to functionate, only the more anterior teeth being used. According to Lamarck, this alone would be sufficient for the disappearance of the fourth molar. This viewpoint, however, is not tenable in the light of the more modern theories of Weissman and others; that is, the use or disuse of an organ by an individual during its lifetime in nowise affects the condition of that organ in its progeny. For example, if a man develops a large biceps muscle by extensive use of his arm, the offspring of that individual will not therefore be born with a large biceps muscle or *vice versa*. Then why does an organ disappear? As long as it ceases to functionate, the energy expended in the maintenance of an organ is wasted, the result being a material loss to the individual, and thereby, in the long run of life, causing his elimination. This factor is of course exceedingly small, since the energy expended in the maintenance of a tooth in healthy condition is small. In the case of other parts, such as the appendix in apes, which is about a foot long, there would be required a greater amount of energy for the upkeep of that organ and to combat infection which may arise therein. The only other considerations are the physical conditions arising, that is, the impaction of the molar in the case. To an individual under the mode of life of that time, this condition of impacted molar would result in speedy elimination—first because the jaw was one of the principal weapons of defense and offense; second, faulty and painful mastication would cause starvation, and third, because of the direct effect of pain upon the system. With the shortening of the jaw these cases become more frequent, thus we have a very powerful and rapid force tending to eliminate the individuals with four molars. The few individuals fortunate enough to be born with three molars would have an exceedingly great advantage over their competitors, and their kind would therefore readily displace the others.

THE APPLICATION OF THE SAME FORCES TO THE ELIMINATION OF THE THIRD MOLAR.

The shortening of the jaw is still going on. In the time of the fourth molar, the food being bulky in nature, the shortened vertical motion of the molar was a disadvantage; but with the present character of our diet, far from being a disadvantage it may be an advantage, since the function of the molar today is a grinding—side-to-side—rather than an incising—up-and-down—movement. We see, then, that from the change of diet the shortening of the jaw does not decrease, but may perhaps actually increase the function. So that a factor which was of important consideration in the elimination of the fourth molar does not apply in the elimination of the third molar. The jaw is still shortening, and the third molar does not lose its function. Therefore the question to be considered is, Does the cost of preservation of the third molar increase? However, as in the case of the fourth molar, the cost is practically negligible. Then the only factor remaining to be considered is the possibility of the impaction of the third molar. This is of considerable importance, for an impacted molar could unfit an individual in the competition for existence. "An impacted third molar may cause cellulitis. In this case the inflammation generally passes upward to the temporo-mandibular articulation, causing acute ankylosis." (Ivy.) But we now have, through the dentist, an active force of adaptation, that is, the impacted third molar is removed, and with it are removed all the disadvantages of impaction. Thus the energy expended in the maintenance of the third molar is practically *nil.* It serves its function, and the consequences of impaction are immediately removed by the active interference of the dentist.

The very early evolution of man was what we call passive; the unfit were eliminated and the fit survived. There was a change in the species in every way, both as to its physical ability and as to its outward appearance. For example, let us take the polar bear, which took on the white color passively. The black bear in the lands of snow and ice was conspicuous, and was easily seen and captured by the natives. The white bear was not so easily noticed and therefore survived. Frequently a weak white bear must have survived in competition with a strong black bear. You can readily see that in this sort of adaptation the species has no power in itself of meeting the standard of fitness. In active adaptation, however, which is the form of evolution of the present day, the standard of fitness is not that of outward appearance, but rather of physical ability. The race therefore tends to preserve characteristics which are not involved in its struggle for existence.

CONCLUSION.

The removal of the third molar in an individual in no way affects the existence of the third molar in the offspring of that individual, since acquired characteristics are not inherited. There is no reason to expect that spontaneous variation will come to the rescue and exterminate the third molar, for selection is defeated here by the dentist, who eliminates the only disadvantage, and thereby enables an individual with three molars to be as comfortable as one with two molars. Inasmuch as the third molar, in spite of the shortening of the jaw, continues to exercise its function, and owing to the fact that the ill consequences of impaction are removed by the dentist, we must conclude that the third molar will not disappear from the human jaw, but will remain probably in a rudimentary condition.

8 Winter st.

Oral Hygiene—Prophylaxis—Restoration: The Triple Alliance.

By JAS. KENDALL BURGESS, D.D.S., New York, N. Y.

(Read before the Pennsylvania State Dental Society at its annual meeting, Philadelphia, June 26–28, 1917.)

THE title of my paper brings together three subjects so closely related and interdependent that, like warp and woof, they are intertwined and woven into one complete offensive and defensive against the invading and destructive forces that attack the oral cavity, and through it the whole human organism. But before we can discuss them intelligently in their relations to each other it will be necessary to analyze each individually and establish its status as nearly as possible as an independent institution.

The term Oral Hygiene seems to have become associated in many minds solely with the use of the toothbrush and kindred cleansing apparatus, but in its true significance it is a far more comprehensive term. Oral hygiene has for its goal a physiological status, and includes ways and means to establish and maintain the vitality, tone, and resistance of the teeth and tissues in the oral cavity. In considering it we must first divide it into two general departments: Objective, its practice by the operator, and subjective, its performance by the patient. And, since the efforts of the operator are supposed to anticipate and prepare the way for intelligent and adequate performance on the patient's part, it seems wise to discuss that aspect first. There is no need of the human mouth requiring operative interference so universal and so constant as that calling for objective hygiene, or its practice by the operator. From the case presenting the simple stain that merits our disfavor chiefly as a cosmetic blemish to that of the very loose tooth condemned to removal as a pathological menace, however great or important the other requirements may be and whether the patient be neglectful or constant in his care, it is rare indeed, if we would serve his best interests, that we can escape the necessity for performing this service. The requirements of this objective service are so varied, however, that they cannot be considered under a single heading. We shall subdivide it, therefore, into its component parts for convenience of analysis and study, viz: Surgical, sanitary, therapeutic, and educational. Because of its greater importance and the fact that its proper achievement comprehends in some measure the other three, we shall consider the surgical aspect first. Surgical hygiene presupposes pathological conditions, and, like all true surgery, its aim is to discover and remove the cause.

PYORRHEA ALVEOLARIS.

A study of surgical oral hygiene leads us naturally to the consideration of pyorrhea, or as much of it as is pertinent to the establishment of the triple relationship which forms the subject of our essay: First, because of its great prevalence and its tragic *dénouement;* second, because, while not all morbid disturbances of the peridental investment consist of pyorrhea in its full development, many of them have the same causative factors, and, barring operative interference, lead into it just as surely as the infant grows into childhood, the child to youth, and the youth to manhood; and third, because any study of pyorrhea and the means for its eradication must comprehend these lesser disturbances. It is generally agreed that the word pyorrhea, meaning a flow of pus, is not an accurate name for the conditions which it is frequently intended to describe, because in its true significance it is not applicable to all of the pathological conditions generically termed pyorrhea. The earlier stages—before the influence of pus is in evidence in the dissolution of the investing tissues—might be more accurately characterized as "pre-pyorrhea." But for the later stages pyorrhea is the least cumbersome term associated with these conditions, and in the minds of most clinicians has come to be merely an appellation and not a descriptive term. It seems likely, therefore, that the profession's acceptance of it is final.

I have no purpose to lead you through the maze and labyrinth of expressed opinion on the etiology of pyorrhea. But I do want to bring to your attention the conclusions deduced from my observation and clinical experience extending over a number of years in my own practice, and from close contact with the practice of others who are curing this condition.

The whole matter of pyorrhea and everything pertaining to it has been hedged about with a great deal more of mystery than the facts in the case have warranted. It seems to me to be one of the most obvious and natural manifestations with which we have to deal; that in few other abnormal conditions is the cause such an open book and the effect a more natural consequence.

To begin with, pyorrhea is not a disease unless one should consider a mashed thumb and its sequelæ a disease. It is a condition due to injury of the tissues, not necessarily through accidental violence but rather an incidental injury or trauma due to abnormal physical contact and relations—a traumatic disturbance in which nature sets about to care for the injury just as she would an injury of a similar nature in any other part of the body. For example, if I force a splinter into my hand and do not remove it, what occurs? Simply this: Nature in her own way and by means that she keeps always at her command sets about freeing herself from the intruder by breaking down the contiguous layers of tissue—relieving the pressure, creating a lubricant, and forcing the foreign body from its lodging-place. That, in a word, is pyorrhea. It is simply and solely nature's effort to free herself from an incubus; and precisely the same phenomena are observed in the oral cavity. A bit of tartar clings to a tooth and becomes the nucleus of larger incrustations; an ill-fitting crown, gold or porcelain, is forced into the tissues; a poorly placed filling is allowed to overflow the cavity margin into the cervical tissues. These things are mechanical irritants, and since nature has no means of loosening their hold and forcing them from the tooth, she has no recourse but to deal with the combination of tooth and irritant, which thus united become to all intents and purposes a foreign body, and like the muskrat which bites off his leg to free himself from the trap which has captured him, she sets her machinery in motion and begins the task of breaking down the contiguous tissue and freeing herself from one of her own members which has contracted this unholy alliance and become a thorn in the flesh. The burden removed and the end accomplished, she abandons her belligerent mood and settles down to a benign existence. On account of the character of the tissues with which she has to deal it may be a long and tedious process, but her effort is no less certainly directed toward that end.

The same principle applies to teeth in other conditions. A tooth well-behaved in normal relations becomes, under the hammering and swaying of its antagonist or antagonists in traumatic occlusion, an intolerable mechanical irritant. Teeth out of normal proximity, catching and holding between them fibrous food particles, are prolific sources of mechanical irritation, as are picks and floss silk in careless or incompetent hands. These and many other causes, varying in detail but always the same in effect, result in trauma, and in nature's effort, through all its stages to exfoliation, to free herself from an unwholesome and unwelcome influence. There is no doubt that nature in her wise economy numbers destroyers as well as builders among her warriors and protectors. The study of the minutiæ of her technique and of the particular agencies which she calls to her aid in accomplishing this result are of interest to the histologist, and our literature would not be complete without it; but while the clinician has an academic interest in these matters, they hold little of practical value for him, and it is not the purpose of this paper to enter into a discussion of them.

The difference of opinion as to whether or not pyorrhea is a constitutional disorder is due largely to a confusion of ideas. Through the absorption of its deleterious products into the system pyorrhea may produce more or less serious disturbances and thus become constitutional in effect, but so far as causation is concerned it is no more constitutional than a black-eye or a swelling caused by forcing a splinter into the finger. The difference is that in one case the trauma is sudden and more violent and the effect more rapidly produced, but fleeting, since the cause is immediately removed. In pyorrhea the trauma is more gradual in its inception and progress, but inasmuch as the cause is not removed, the effect not only remains but is cumulative. There is, too, beyond doubt, a difference in the virulence of the attacking organisms, and likewise a difference in the degree of resistance to their attacks, in different individuals or in the same individual under varying degrees of systemic integrity—tone, vitality, etc.—such as will follow trauma in any other part of the body. But these are merely accompanying conditions which determine in some measure the progress of the disturbance, and are not causative factors, because if there were no trauma and no lowered vitality of the local tissues there would be no infection, no tissue degeneration, and nothing to progress.

This, then, is the simple story of pyorrhea, and there is no more mystery about it than there is about the sequence of events following the forcing of a splinter into the finger. It is simply nature's method of resenting any interference from without in her internal affairs and her effort to free herself from the intolerable influence of the invader.

The question which confronts the clinician is, How can we aid nature to rid herself of the menace and assist her in the retention of the valuable organs and tissues thus jeoparded? The answer, reduced to concrete terms, is simply this: Remove the products of accretion—of secretion—of excretion—of concretion, and of tissue degeneration, and relieve traumatic occlusion. By "the products of accretion" is meant food débris found about the necks of teeth, in the interdental spaces, and in pyorrhea pockets, broken ends of toothpicks, toothbrush bristles, and the like. By "the products of secretion" is meant salivary tartar, stain, mucilaginous plaques, and all substances deposited on the teeth from the oral secretions. By "the products of excretion" is meant serumal calculus found on the necks and roots of the teeth and in the bifurcations. It is a product of pyorrhea or "pre-pyorrhea" and is itself an aggravating cause of continued progress. By the "products of concretion" is meant the flaring margins of bands and crowns, protruding shoulders of pivot teeth, overlapping margins of fillings, inlays, and other restorations, especially large and jagged bulks of amalgam left from proximal filling operations done without the aid of matrix bands; bridge work, particularly of the cantilever type, placed on insecure foundations or one strained through excess of leverage or stress against insufficient strength of attachment or resistance; partial plate attachments producing the same results, or any foreign material in any form and for whatever purpose placed in the mouth by operative effort and productive of traumatic and morbid conditions. By "the products of tissue degeneration" is meant necrotic bone and peridental membrane; decayed, infected, and decalcified tooth tissue, especially at or beyond the necks of the teeth and underlapping the soft tissues; diseased and putrescent pulps, and the resultant infections of the pulp chamber and root-canals; infected root-ends, and pathological tissues in the peri-apical region when they are associated with the lesion; roots denuded of their membrane and swaying in the tissues; gangrenous gum tissue, and finally the teeth themselves, where for pathological or mechanical reasons their retention as harmless if not serviceable organs is untenable. By "the relief of traumatic occlusion" is meant its correction by grinding the teeth in one or both jaws, or the removal of a bridge, crown, plate, filling, inlay, tooth, or what not, in part or as a whole, if necessary to accomplish the purpose.

Thus we have stated the broad, underlying principles which should govern the efforts of the surgical hygienist. The details of instruments and technique by which these principles are reduced to practice are matters of great importance, but not germane to this discussion.

SANITARY HYGIENE.

This brings us to the second subdivision of oral hygiene, Sanitary Hygiene. Here is presupposed an unsanitary state of the oral cavity which has not eventuated in pathological conditions. Where morbid conditions *do* exist the operative program already described includes of necessity the sanitary program, but in the pre-morbid and post-morbid stages, efforts directed toward correction, while pursued along the same general lines and of extreme importance, are less comprehensive and must be classed as sanitary rather than surgical.

THE DENTAL HYGIENIST.

Our chief interest in a further discussion of this phase of oral hygiene is to consider somewhat the status of the hygienic nurse. It seems to your essayist that there is an alarming tendency in the dental profession to turn the whole matter of oral hygiene in all of its phases and everything pertaining to it over to the tender mercies of a woman assistant, by whatever title we choose to call her, and to feel that our duty to our patient and our responsibility for his welfare are thus fulfilled. This tendency is no doubt due to a number of causes, chief of which is a lack of comprehension of the importance of the subject and a feeling that while it requires the services of a graduate expert to put in an amalgam filling or cement a factory-made gold crown to position, anybody can clean teeth. It is a sad comment to be compelled to make that the sum total of the knowledge of so many members of the profession on all matters pertaining to oral hygiene seems to be embodied in that one phrase, "cleaning teeth." I have no doubt that there are women graduates who by training and experience are fitted to do the work of the "surgical oral hygienist," and where found she should be dignified with that title, and a sharp line should be drawn between her and the hygienic nurse or denticurist who is merely trained in the work of cleaning teeth—so-called prophylaxis, but in reality only a very small part of it. Where this latter class of attendant is employed I believe her duties should be both prescribed and circumscribed. They should consist for the most part in the removal of the products of accretion and of secretion as elaborated under the head of surgical hygiene, and in any event should not extend beyond the pre-pyorrhea stage. I do not believe it should be any more the province of the hygienic nurse or denticurist to treat pyorrhea or other morbid conditions of the oral cavity than it is of the manicurist to treat a bone felon or a trained nurse to perform an amputation or a laparotomy.

THERAPEUTIC HYGIENE.

We come now to our third subdivision —Therapeutic Hygiene. Pyorrhea being a condition due to injurious abnormal physical contact or trauma, it must be apparent that the rationale of its treatment lies in the relief of this physical contact by the surgical means described under the first subdivision, and that therapeutics must play but a minor and incidental rôle in the work of curing pyorrhea, and one which need not concern us here. The frequent and regular application of styptics and astringents or of drugs and nostrums dependent upon these properties for their effect, as is practiced by many, is but a device of the mentally or morally inept. We can never hope to remove causes by treating symptoms. The use of serums and vaccines has been given a large place in our remedial efforts, but their employment is based on a misconception of the true nature of pyorrhea and its causes. The supposed need of some systemic remedy for pyorrhea is not difficult to understand when one goes to the root of the matter. Perfect results depend upon perfect technique. Clean teeth externally in proper relations mean clean tissues internally, and conversely, uncontaminated investment tissues demand clean teeth in proper relations. But one who has not comprehended this vital principle and whose operative efforts are perfunctory, or one whose understanding of it is blurred and hazy and whose technique is inaccurate and incomplete, will obtain results in proportion to the quality of the service he renders. Inasmuch and in proportion as his work is without merit his results will be unsatisfactory. He concludes therefore that pyorrhea is not to be cured by operative measures, and begins to seek through systemic channels the results he has been unable to procure by local efforts. The proof of the efficacy of local operative measures properly carried out is in the results obtained by the men who are curing pyorrhea by such measures. When a vaccine or a serum is found that will remove splinters from the finger, or tartar and ill-fitting crowns from teeth, or take the place of the stone in relieving traumatic occlusion, it might do some good in pyorrhea. But these things have to be done in any event, and at present by some other means, and the technical program indicated, properly carried out, obviates the necessity for these symptom-treating agents.

In the matter of systemic medication in connection with pyorrhea or other lesions of the oral cavity, I do not believe any man has the moral right to prescribe internal remedies or constitutional treatment for a patient unless he is competent to make a thorough physical diagnosis of that patient and determine the condition of his organs and tissues and their requirements, and the effect his supposed measures for relief will have on the whole systemic economy. If the dentist thinks he is competent to do this, and feels at liberty to usurp this prerogative of the general medical practitioner, it must remain a matter between him and his patient. I am not competent to do this and I do not undertake it. The eminent Dr. Osler once asked a humble dentist to prescribe a remedy for his mouth condition, and insisted very earnestly on exact directions as to strength and frequency in its use. I glory in such simplicity—in a mind great enough to concede some limitations.

EDUCATIONAL HYGIENE.

The last subdivision of oral hygiene is Educational Hygiene. Sanitation is a very important factor in maintaining a physiological state of the oral cavity, and in the very nature of the case sanitation must depend largely upon the patient's efforts. But since the knowledge and requirements of successful hygienic performance are not born with the patient but must be acquired, they are likely to bear a direct relation to the educational efforts of the operator. Herein lies the duty of the educational hygienist, to make the patient his agent and representative as it were in taking care of his case in the operator's absence. To this end he must instruct the patient in both the theory and practice of mouth sanitation, and by both precept and example if necessary. This instruction should comprise an explanation of the causes of pyorrhea and methods of preventing it, a differentiation between cure and immunization, reasons for the necessity for sanitary hygiene, a description of the implements and materials with which to accomplish it and the reason for their use, instruction as to the proper manner and the occasion and frequency of their use, and the special occasion, if any, when necessary, apart from its regular periodical performance; the penalties of neglect or of carelessness and inefficiency, the danger to the tissues in the improper handling of any part of the cleansing paraphernalia, the legitimate uses and the abuses of the dental apparatus with particular reference to any special care or consideration to be bestowed on any part, and the reasons for it, and the frequency with which he should return for inspection and to have his own efforts supplemented by those of the operator. Intelligent and efficient co-operation of the patient cannot reasonably be expected unless he is thoroughly enlightened as to the functions and the care and maintenance of the oral cavity and its contents, and the dangers that beset it from within and without.

THE CARE OF THE ORAL CAVITY BY THE PATIENT.

This concludes the program of operative effort and care—objective oral hygiene. Subjective Oral Hygiene, or the care of the oral cavity by the patient, is a matter of great importance, but a consideration of it here would consume more time than its value in our discussion warrants. I shall hope, therefore, to present it on another occasion.

PROPHYLAXIS.

We come now to the second division of our subject—Prophylaxis. Prophylaxis presupposes a physiological state of the organs and tissues, and concerns itself with the maintenance of physical integrity and functional efficiency. We shall study it briefly under three subdivisions. As applied to the oral cavity it follows naturally the program of surgical hygiene, and is so closely interwoven with oral hygiene that both sanitary and educational hygiene as practiced by the operator, and the entire hygiene performance of the patient, are themselves prophylactic measures. That is to say, the immediate effect of these efforts is hygienic and their ultimate result is prophylaxis. So we shall characterize them as objective and subjective hygienic prophylaxis. This is the first subdivision, and a consideration of it brings up the matter of the post-operative care of pyorrhea. The question of whether or not pyorrhea is curable has been a very disturbing one to the profession as well as to the laity. The uncertainty has been due to a confusion of terms and ideas involved in the words "cure" and "immunization." Pyorrhea is curable just as a thousand other lesions are curable, but one curing does not immunize the tissues against a recurrence of the condition. If I wound my hand with a splinter I remove the splinter and heal the wound, but if I force another splinter into my hand I may certainly expect to have to repeat the process. If after pyorrhea is cured the conditions which caused it are allowed to recur and to be maintained, or other causative relations are established, we may be very sure of a recurrence. It should be patent to both patient and operator that eternal vigilance must be the price of immunity.

Sanitary hygiene, so far as its influence extends, is to pyorrhea what vaccination is to smallpox or typhoid fever, and the frequency of the need of its performance by the operator will depend upon the success of the patient's efforts in his own behalf plus the vitality and resistance of his tissues. There has been much quibbling among the nonconformists because, as they say, the lost tissue cannot be restored, but the same claim might be made against most wounds because they leave their scars. The changed relations of teeth and tissues due to lost tissue merely represent the scars of the wounds. These changed relations lead us to a consideration of the second subdivision, Constructive Prophylaxis, the function of which is to protect the vital relation existing between the teeth and their supporting tissues.

The physical details and relations of the teeth, their supporting tissues, and their controlling mechanism, and the mechanical uses to which they are put, can never be lost sight of or ignored. We are always confronted with the problems arising out of the stability of anchorage or resistance and the leverage or stress produced by the normal and legitimate uses of the teeth and the direct relation of the one to the other. Having important bearing on these are the matters of tooth conformation, approximal relations, and occlusal relations. Stress is the result of the muscular action of the jaws, and the strength of the muscles and the force of its application regulate the degree of stress in a given case. Stability of anchorage or resistance depends upon the proportion and the relation of that part of the tooth embedded in the bony structures of the alveolus to the part that stands or remains above it; in other words, to the distance of the fulcrum or alveolar support from the point of attack where the stress is applied. The more nearly normal the depth of anchorage in the bony structures the stronger the resistance, and conversely, the greater the proportion of the tooth exposed above the alveolus by tissue destruction the weaker the resistance. The importance of this lies in the fact that the destruction of tissue by pyorrhea moves the fulcrum farther from the point of attack, lessens the stability of anchorage, and weakens the resistance while the strength and force of the muscular action and consequently the stress remain undiminished.

In normal relations we have a security of anchorage or resistance superior to all the demands of stress—in other words, a balance in favor of resistance; but as tissue destruction progresses this balance begins to vary, comes presently to be equal, and finally to favor stress—a condition in which the anchorage resistance is unequal to the demands put upon it. We may express these stages in three equations, thus:

Stage 1: Anchorage resistance = Stress *plus*.
Stage 2: " " = Stress.
Stage 3: " " *plus* = Stress
or Anchorage resistance = Stress *minus*.

Following our surgical hygienic program, by means of which the tissues are rid of all encumbrances, we not infrequently find ourselves confronted by the conditions described in stage 3, in which it requires the anchorage *plus* to equal stress or stress *minus* to be tolerated by the anchorage. The danger in this condition lies in the fact that, while in occlusion stable teeth move on each other and spare their sockets, unstable teeth move each other and wear their sockets. In addition to this actual mechanical wear, the state of trauma thus produced is a constant irritant against which nature is forced to protect herself by exfoliation, as described earlier in this paper.

The problem which confronts the constructive prophylactician, then, is to limit or maintain this tooth movement as nearly as possible to the normal by providing the supplemental strength which it is necessary to add to this reduced anchorage resistance to make it equal to the stress, or else reduce the stress to meet the available resistance, or both—in other words, to balance stress and resistance. To increase the resistance we must have recourse to the law which says, "In union there is strength." The mutual support gained by the establishment of normal approximal relations, especially in the posterior part of the mouth, is a valuable aid to this end. When this does not suffice we must apply the means best suited to each case of securing teeth with weakened anchorage to each other, and wherever possible, to teeth in secure anchorage. This process is what has been described as stabilization. The reduction of stress must be accomplished, if at all, by the establishment as far as possible of rational occlusal surface conformation and rational occlusal relations—not necessarily normal conformation and occlusion, but conformation and occlusal relations calculated on the basis of available resistance. In the co-ordination of these two plans of raising resistance and reducing stress according to the needs and possibilities of the case we balance stress and resistance, and so achieve *work* for overwork or inactivity, *function* for trauma, *order* for chaos.

The filling of cavities any part of which underlie the soft tissues, and of root-canals that have any connection with the lesion, and the establishment as far as possible of normal proximal relations for the protection of the tissues in the interdental space from the traumatic influence of wedging food débris, are also important items in the program of the constructive prophylactician.

But this is not all of prophylaxis. Just as the welfare of the denture depends upon the welfare of the individual teeth that compose it, just so the welfare of the individual tooth depends upon the welfare of its component parts. This brings us to a discussion of our third subdivision, Conservative Prophylaxis. Technically prophylaxis has reference to prevention of disease, but, I care not what its technical definition, any so-called prophylaxis which ignores conservation as its vital principle—which does not protect the human organism from dismemberment and the destruction, by whatever agencies, of its organs and tissues; which is not broad enough in its protective measures to include destructive processes of whatever nature, whether pathological or mechanical, is a mocking and a derision, a travesty on prophylaxis. He would be a queer shepherd who would take precautions for his sheep against the ravages of disease and leave them unprotected to the mercy of the wolves. If prophylaxis means anything, it is a measure of conservation and means protection against violent destruction as well as against gradual deterioration. Prophylaxis in this broad and inclusive sense is the cornerstone of every successful effort at restoration.

FIXED VS. REMOVABLE BRIDGE WORK.

There are two schools or classes of operators, however, starting from different premises, and seeking, frequently, different results, whose paths cross at this point. The first, with a distorted perspective and a perverted sense of relative values, confounds sanitary hygiene with true prophylaxis, and violates the very vitals of prophylaxis in attempting to carry sanitation to such ridiculous extremes as to make a fetish of it. These are our removable-bridge Jack-the-rippers who ravage the vital organs of the teeth, frequently mutilating the teeth themselves beyond recognition, amputate and discard the torso in many instances, ream the nether extremity to a mere film, and prate the while about sanitation as a means to prophylaxis. This surely is taking in at the spigot and letting out at the bung.

To the second class belong those brilliant and philanthropic individuals who would remove our vital organs early in life because forsooth there might otherwise be some disturbance of them later in life. They practice extension for prevention, or, more properly, annihilation for prevention—gone mad and run amuck. It is based on the theory that what is destroyed cannot deteriorate. I do not care whose idea it is or how much standardized it may have become, the extent to which extension for prevention is practiced by many operators is a crime against nature and every principle of prophylaxis. If you ask me, What is the function of the pulp in adult life? I cannot tell you; but I can note the degenerative changes in color, in texture and in other ways in the pulpless tooth, and I know that these changes have been brought about by the death of that pulp and the cessation of its function. Obviously the best way to prevent a pathological development is to conserve a physiological status, and dismemberment is not a means to that end. No man has a moral or intellectual right to place a time limit on the usefulness of these organs and tissues of God's creation. When nature is through with her pulps, when they have served their purpose and have no further function to perform we may be sure that in her own way she will discard them, but until that time their protection and care is a very serious duty of the conservative prophylactician.

HYGIENIC REQUIREMENTS OF DENTAL RESTORATIONS.

Every restoration in its relation to oral hygiene and prophylaxis should stand solidly upon a four-square foundation. First: It should protect all the tissues and functions of the teeth to the greatest possible extent from operative violence in conception and execution as well as from degenerative processes during its tenancy, and so be a conservative prophylactic measure. Second: It should be constructed on the engineering principles discussed under the head of constructive prophylaxis, and for the reasons there given, so that in service it will conserve the vital relations between the tooth and its supporting tissues, and protect the supporting tissues from the detrimental influences of loose teeth in traumatic contact with tongue, cheek, lips, and occluding teeth. Third: It should conform to the laws of surgical hygiene in that it should present no concretions at the gingival border that disturb the integrity and relations of the supporting tissues and bring about pollution and degenerative processes. Fourth: It should lend all possible aid to sanitary hygiene in fostering to the smallest possible extent the accumulation of the products of accretion and of secretion and in offering the least possible obstruction to their removal both by the operator and by the patient. In proportion as it accomplishes these results it becomes a measure of hygienic prophylaxis.

It requires no argument to show that the removable bridge does not fulfil these requirements. With its destruction of the pulp and of the hard tissues of the tooth, extending in many instances to the entire crown and a very considerable portion of the interior of the root, it sacrifices everything of conservative prophylaxis for a gain of questionable proportions or value in sanitary hygiene. In addition to this it is impossible to believe that it fulfils the requirements of constructive prophylaxis in the type of cases where tissue destruction has weakened the anchorage resistance and makes this a consideration. The constant disturbance of the relation between the tooth and its supporting tissues, necessitated by the periodical removal of the denture, must under these conditions militate against the welfare of these relations, which, far more than those of normal status, should be free from this frequently recurring traumatice interference. Why the uncontrollable anxiety on the part of the removable-bridge advocates about the scrupulous cleanliness of the bridge which is but part of a denture, the remainder of which, together with the stationary parts necessary to hold every removable bridge in place, must remain in the mouth and be cleansed there if at all? Why need the bridge be cleaner than the natural organs. If a properly constructed bridge cannot be cleaned in the mouth, then the natural teeth cannot be cleansed there, so that if it is necessary to remove the bridge for cleansing it is just as necessary to remove the natural denture. Now, either the removable bridge advocates are wrong, or Providence was shortsighted. To say the least they are inconsistent. The least they can consistently advocate is the excision of all teeth at the gum line and their replacement with an entire dental apparatus that can be removed for cleansing.

The shell-crown bridge anchorage, whether used for the removal or fixed type of bridge work, is hopeless from these hygienic and prophylactic points of view. The properly fitted crown necessitates excessive tissue destruction in violation of the principles of conservative prophylaxis, and the ill-fitting crown with its concretions under the gingivæ —probably comprising something over 99 per cent. of the total output—disobeys every rule of both surgical hygiene and hygienic prophylaxis. All attachments of whatever type for anterior teeth that necessitate the removal of their pulps or form traumatic encroachments on or under the soft tissues fall short of one or more of these requirements and come under the ban.

The type of restoration that conforms in most details and so in greatest measure to the requirements as we have stated them is the fixed bridge constructed on attachments that restore and conform to the outline of the abutment teeth in the manner of the gold inlay or restoration, and which necessitate for their anchorage the sacrifice of so much tooth tissue only as will allow for a sufficient thickness of metal to bear the stress put upon the suspension in normal use.

The supplied or substitute teeth in this construction conform as nearly as possible to the outlines of the natural organs which they replace, with their contact points congealed or fused together, as it were, to a sufficient extent to give a safe margin of strength and mutual support under stress. Their cervical ends are reduced in area as much as circumstances will admit and bear a relation to the gum that precludes the entrance of food débris in particles of considerable size or quantity, but allow the passage of floss for cleansing. This is near-to-nature bridge work based on principles of surgery and engineering that are fundamental and vital and as imperative to successful restoration as is the establishment of normal occlusion to orthodontia.

We cannot dissociate the component tissues of the tooth and their functions from each other any more than we can segregate the oral cavity and its contents from the rest of the organism. Nor can we get away from the principle that "If one part suffer, all the parts suffer with it." The sacredness and inviolability of the human organism are not matters of opinion, but inherent and fundamental truths which no man can profane and remain blameless. Systemic integrity and functional efficiency are the goal of every true disciple of the healing art, and the principles and practice that maintain to the greatest extent the integrity and welfare of the individual parts are the greatest possible aids to systemic prophylaxis.

149 BROADWAY.

Type *vs.* Temperament in the Selection of Teeth.

(III.)

By **NORMAN S. ESSIG, D.D.S., Philadelphia, Pa.**

IN his previous articles on the subject of Type *vs.* Temperament in the Selection of Teeth the writer has placed before the profession the method he has employed to systematize the selection and classification of artificial teeth in his practice, together with his interpretation of the subject in general in the light of established scientific facts.

When we say that "Teeth are a law unto themselves," we must concede many phases of this subject. In a broad natural sense, a law is the expression of the regular or constant order of operation of certain phenomena—it is only a law when co-ordinated with established facts; but as this "constant order" does not, so far as we can discern, maintain in the development of human teeth collectively, they necessarily, when taken as we find them, become a law unto themselves individually.

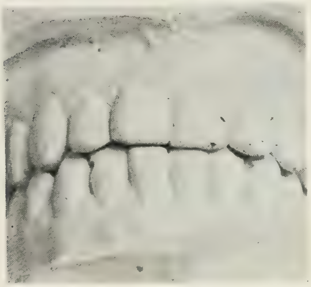
We realize that such is the case when we recognize the fact that any type of tooth may be found in any type of countenance, regardless of nationality or of environment; and again, in youth teeth are truer to type because they are not modified by wear, elongation, or recession, nor by various other modifications through use.

They express temperament according to their arrangement on the ridge which forms the dental arch. One of the most important factors tending to establish a creed along these lines is that where the law of inheritance makes itself manifest the offspring often inherits the large teeth of one parent and the small arch of the other, resulting either in modification of the teeth as to size and type, or a crowded denture, making regulation necessary. Were this not so, all those having perfect health would have perfect teeth of a perfect type, and all persons having great force of character would have such force designated in the type and arrangement of the organs of mastication, etc. In other words, if dental conditions as we find them were not the result of adaptive modification to environmental influences—and thus to a large extent arbitrary, and a law unto themselves—the dentist could, after a comparatively superficial acquaintance with edentulous patients, anticipate the form and arrangement indicated in each case. Color, form, density, and other distinctive features would be adequately and appropriately suggested, and there would *not* be almost unlimited variance in the form and type of the lateral incisors.

The possible fourth type, which is sometimes mentioned to classify with those more definitely and scientifically established, resembles closely the unmodified tooth of the young adult just at the period of complete eruption rather than anything else. This tooth does not project through the soft tissue fully to the enamel line, and shows no neck whatever; therefore it appears to be of a shorter, thicker type, having fewer compound curves, although upon extraction it may present a different aspect, and resemble more closely the other classified types with which we are more familiar.

Whether the position of the temperamentalist is or is not tenable, whether or not certain typal tooth forms belong in the mouths of particular temperaments, we know that there are three distinct types as a basis of classification; hence it

GROUP I: These illustrations of the fully erupted tooth of young adults show no effort on the part of nature toward automatic readjustment or wear, either approximal or occlusal, and are truer to type.



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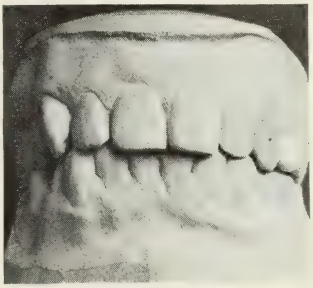

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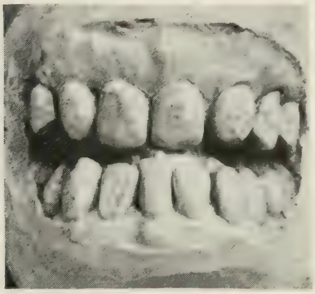
may be said that the basal types are also the foundation for the temperamental theory—though it must not, however, be interpreted from this that the author is an adherent of a temperamental theory as such.

Strong characteristic dominant traits, acquired by mental or physical habits or defects, are usually manifest in some way in the physiognomy of man, and in most instances make themselves evident to the greatest degree in middle life by the particular way in which use and wear occur, the result of which produces a characteristic effect, either harmonious or otherwise; and the effect so produced becomes peculiar to the individual in time by the modification of the form and position of the organs of mastication.

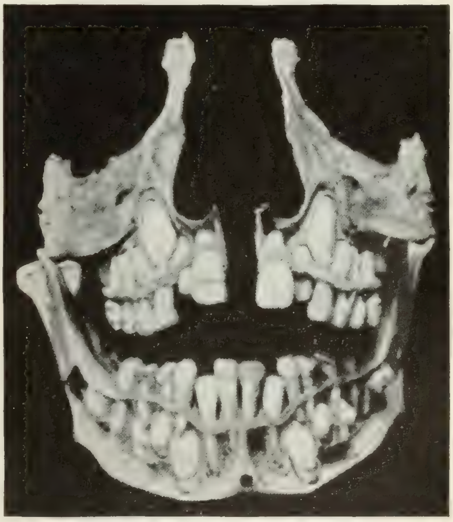
A



The laterals are so much "a law unto themselves" that in some instances they are absent altogether.

Therefore, in summing up the question of adequate selection to meet the requirements of individual cases, we find that human teeth, as viewed in relation to their process of development and eruption, are a law unto themselves.

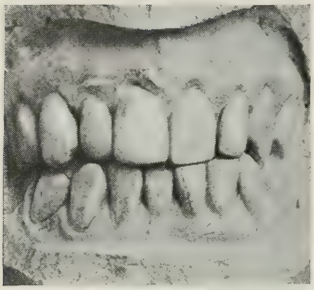
B



Demonstrating the constricted space allotted for the development of the lateral incisor.

While the anatomy of the crania in man is comparatively the same, proportionately there is a great variation due to heredity; and thus the development

GROUP II: Showing laterals which maintain the general type



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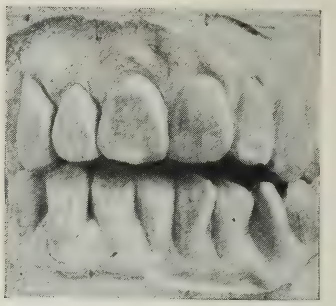

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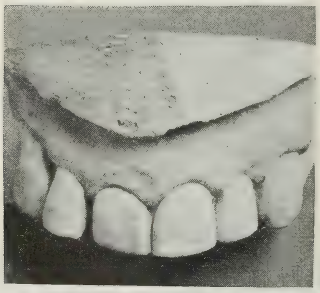

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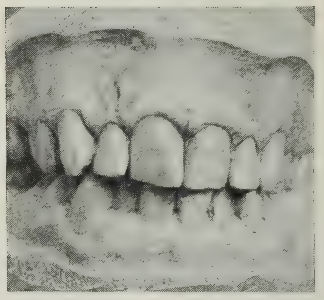

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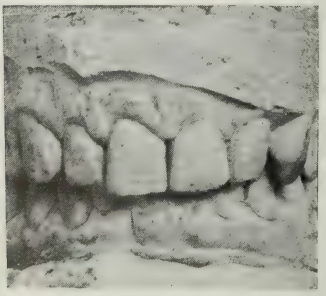

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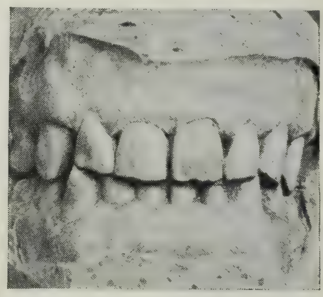

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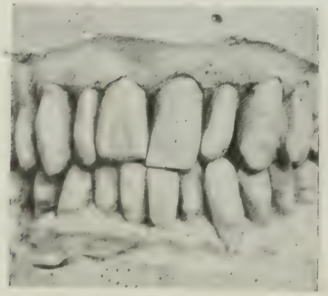
GROUP III: Showing the arbitrary and characterless form of the lateral



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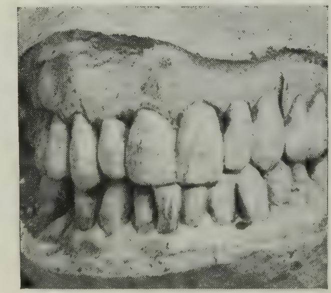

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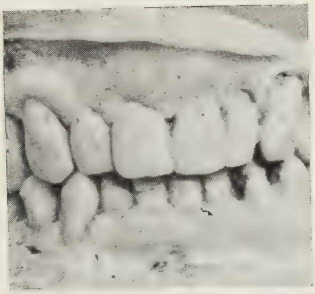
designated by the central incisors. (Compare No. 7, Group IV.)



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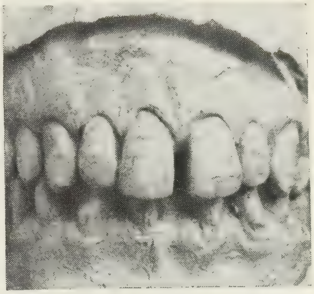

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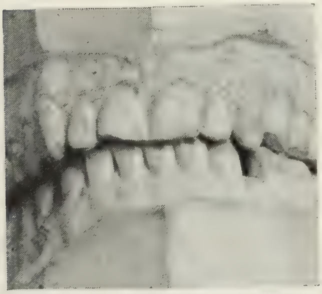

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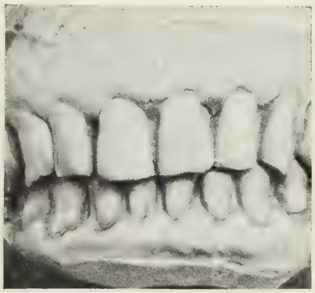

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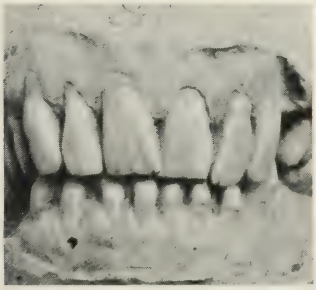

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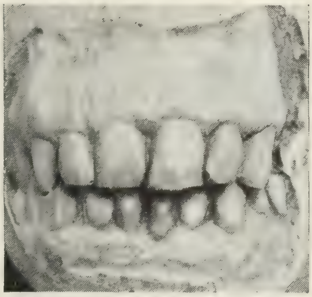

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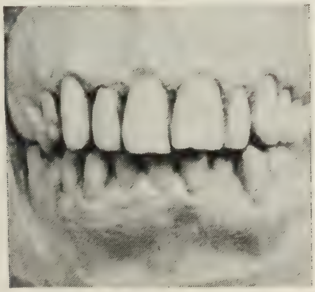
incisors as compared with the type represented by the central incisors.



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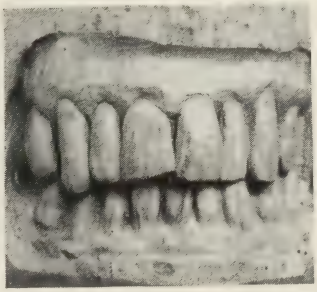

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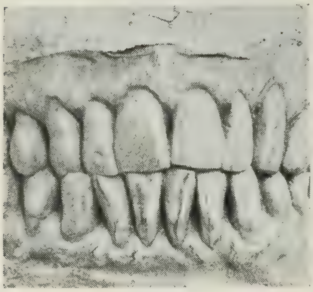
GROUP IV: Expresses characteristic identity, approximal wear, and the
(Compare Nos. 3, 9, and 11



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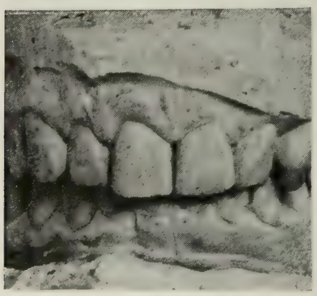

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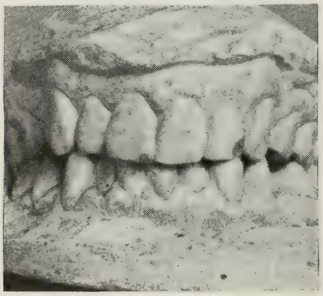

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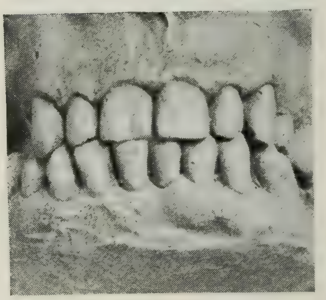

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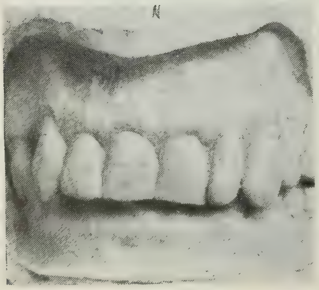

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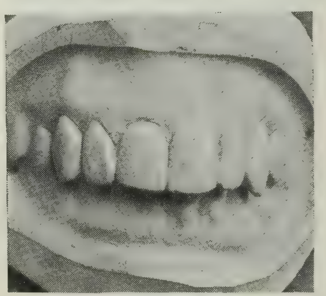

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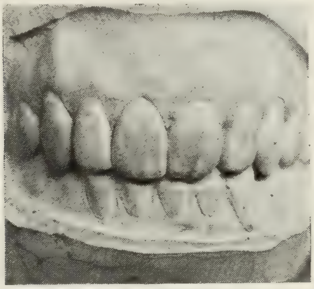
and eruption of the teeth are consequently governed and modified.

The term "temperament," as applied to a dental prosthetic restoration, is merely an expression which is used to designate the effect obtained by the appropriate selection and alignment of any of the three true basal types or their modifications. So that it is perfectly possible for followers of type or of "temperament" to select appropriate and harmonious tooth forms from the same assortment taking the basal types as their standard for selection, inasmuch as the term "temperament" but expresses the effect attained.

Moreover, it is important to note that the lateral teeth are more "a law unto themselves" than any other of the six anterior teeth. This is shown in the accompanying illustrations, which demonstrate the fact that these teeth may be of any form, governed by the space allotted to them by their neighbors the centrals

automatic rearrangement, expressing temperamental characteristic qualities.
of Group II; also Group III.)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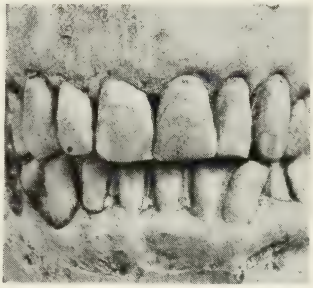
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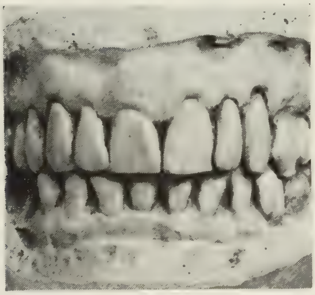
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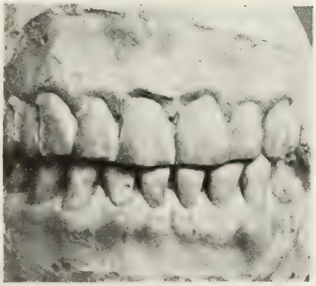
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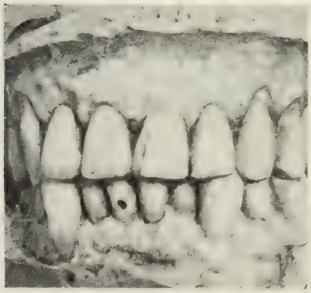
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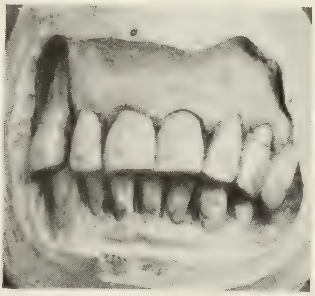
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and cuspids, and it is not unusual to find them missing altogether. (See illustrations *A* and *B*, page 1218.)

The canines, or cuspids, are of the utmost importance in denoting temperamental harmony, and are for the most part strong in form and character in the human being. These teeth are placed in the arch for several important and distinct purposes, which constitute the basis of our calculations in the esthetic field. The purposes assigned to the cuspids are functional, inasmuch as they were in early man useful in seizing and preparing food to be swallowed, and for that reason were equipped with long and stalwart roots which also acted as anchorage points or stabilizers, giving strength to the arch at several points, and were also, it is claimed by some, weapons of defense.

Temperament is not expressed to the maximum degree until characteristic temperamental peculiarities are developed by conditions peculiar to the individual.

Bilateral symmetry is necessary to produce a harmony of line and contour, which of course may be modified by the profile of the tooth to an unlimited degree. We find that there is an automatic rearrangement often expressing temperamental or characteristic facial harmony, or an automatic harmonious discord, produced by habit or anatomical limitations.

At the stage designated as the first degree of wear, rearrangement generally manifests itself by simple occlusal wear, which modifies only occluding surfaces and incisal edges; but at the point of the second degree of wear the approximal surfaces show attrition and the teeth readjust themselves according to the circumstances present in the individual, producing many times a marked modification of the conditions which were present in the same mouth at a previous period, thereby producing an harmonious discord. In time a marked characteristic identity of the mouth takes place, establishing individuality of countenance or facial harmony.

An harmonious discord is often induced by the loss of one or more teeth, which in time causes a shifting of those remaining. This produces many times a change in articulation, causing a marked change in alignment or relation to the opposing teeth, as shown in many of the accompanying illustrations.

In the selection of artificial teeth for a given case the author has chosen, as his guide for the appropriate and harmonious, that portion of the face which is most typical, and which in his opinion gives the greatest scope and facility for selection of conforming lines and facial harmony.* This, as we have already mentioned, gives a bilateral symmetry, and is least affected by light, shade, mode of wearing the hair, or other conditions which affect or modify the contour of the face.

It is also advisable to use as far as possible the true basal types and make the modifications necessary to produce crossings when they are required; because the greater the variance from the true type in the beginning, the more nondescript the teeth are apt to become when modified, unless a very large mold be used and infinite skill be employed.

We therefore find that the three basal types, with a robust and typical cuspid, place in our hands every possibility for the exercise of practical skill and artistic ability.

Nature abhors a straight line, and has formed the organs of mastication in a combination of the most subtle curves which at once subserve the purposes of strength, efficiency, cleanliness, and beauty. It is therefore obviously desirable to maintain these lines or curves with the utmost sincerity in artificial teeth, not only for their hygienic and esthetic features, but because each phase of their construction embodies a definite amount of efficiency and comfort to the wearer of an artificial denture.

General contour, profile, variations of shade, together with the accidents of nature, will tend to accent or modify the appearance of the teeth in the mouth. Nature has made these features so cunningly interdependent that one is absolutely essential to the other, and a change of their relations produces radical transformation or rearrangement of harmonious and artistic identity. The field of art as it pertains to dentistry is a very unusual one in many ways. It demands accuracy and truthfulness even to a greater degree than in its other departments, and while the ideal in the organs of mastication and their relation to facial harmony often is the aim of the artistic operator, the reproduction of irregularity and discord, together with the accidents and defects of nature, is more often his task.

Thus it is that the field is one of endless possibilities and one as yet comparatively unexplored—the only restriction being the limit of one's personal attainments in working out scientifically the problem of anatomical and artistic reproduction.

1700 Locust st.

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* See "Type *vs.* Temperament: The Harmonious Discord," in the November issue of the Dental Cosmos, page 1115.

Removable Hygienic Bridge Work and Partial Dentures.

By J. WRIGHT BEACH, D.D.S., Buffalo, N. Y.

(Read before the Dental Society of the State of New York, at its annual meeting, Rochester, May 10–12, 1917.)

PERHAPS at the present time no question is of greater importance in dentistry than that of the best means of supplying lost dental organs. From time immemorial there has been evidence of more or less intelligent consideration of this subject, and examples of ancient dentistry are to be seen in the museums of Europe in which considerable ingenuity has been displayed in the construction of so-called bridgework.

Modern prosthesis in this special field has revolutionized dental practice, as well as being responsible for the worldwide fame of American dentistry. How well we may merit this preferment is not within the province of this essay to discuss. However, we may feel assured that from the standpoint of mechanical skill, artistic restoration of outline and occlusion, ingenuity, and practical results the American dentist will be able to retain his well-earned laurels without additional effort.

Marvelous methods, wonderful skill, and painstaking technique have been and now are being exhibited by thousands of our craftsmen, thereby rendering a service of untold value to humanity. The beautifully finished, esthetic piece of work appears to the lay observer to be permanent and well-nigh indestructible, yet the dentist sees beyond the highly polished surfaces, and knows that the faultless product of the skilled artisan is not more lasting than the weakest root of its abutments. The searching scrutiny of the dental radiograph all too frequently dissipates apparent truth, and the obstinate arthritis in the great toe-joint spells the death sentence to the bridge that had been the pride and joy of some hardworking, conscientious dentist. Hours of time, detail, thought, and an infinite amount of nerve strain come to naught, and the cold steel mercilessly tears away the glory of our inspiration.

The method about to be described has been dignified by the title "Hygienic Bridgework," and is applicable to a broader range of usefulness than any other method previously devised. We believe the few simple principles underlying this method to be capable of universal application, and we look to the ingenuity of the American dentist for its fullest development; therefore it is not presented as a complete system, but rather as a suggestion to the dental profession of the possibilities which it carries. Present conditions in our own country lead us to fear that we may be called upon to devise the best means of retaining extensive restorations made necessary by gunshot wounds and various other destructives used in battle. This method presents great latitude to the prosthetist in this respect, and should help us out in many puzzling cases. Even though we may not need it for our own countrymen, we shall likely find use for such devices in the treatment of many mutilated unfortunates who will flock to this country after the European war. It also furnishes a quick and practical method of supplying teeth necessary for applicants for enlistment to meet army requirements. A one- or two-tooth bridge may be made in an hour by this method.

The requirements for the bridgework restoration may be summed up as follows: First of all the object is to reproduce adequate masticatory surface; second, to obviate unnecessary destruction of or interference with abutment teeth; third, to give the maximum degree of comfort; fourth, to occasion the minimum amount of pain and discomfort in the accomplishment of these several requirements.

Present-day patients have a right to expect methods of dentistry that are commensurate with present-day progress in every other field of endeavor, and in consequence we must meet these demands if we are to give the greatest good to the greatest number. We are not able to supply more than one-tenth of the need for dental service throughout the civilized world, and if we wish to be looked upon as real benefactors, imbued with the true spirit of our profession, we should increase our endeavors to more nearly meet this need in so far as we are capable. The method we champion was developed with this thought as one of its fundamentals.

It is essentially a method of retention based on the use of bars, rests, and clasps. These may be said to embody the salient features of the suspension and cantilever principles, and may be adapted to the case in hand according to the ingenuity and ability of the operator. In other words, the success or failure of this method depends upon the proper combination of these various principles in their application to a specific case; therefore it furnishes almost an illimitable range for the dentist's capabilities, and is, in consequence, extremely fascinating and engrossing.

I believe the adoption of this method to depend in a great measure upon ridding our minds of a few well-established prejudices which have been, from time immemorial as it were, handed down from generation to generation of dentists, and from which it is high time we were released. First of all, we must be convinced that a correctly made and placed clasp *does not* injure enamel surfaces with which it comes in contact. It will take much argument to drive the contrary notion out of the minds of many dentists who cannot rid themselves of the picture of the old-fashioned broad clasp. Did you ever stop to seriously consider the fact that no matter how broad or narrow a clasp may be, it has but *one point* of contact occluso-gingivally? And if it be swaged or burnished to the buccolingual surfaces to give close contact over a broader area, does that help the situation? Not at all. A correct clasp must have minimum contact with the enamel surface, and be as nearly stationary as possible. Round wire of the smallest adequate gage is most satisfactory, as the contact will be only a line. I have yet to meet with the *first instance of disintegration,* either superficial or otherwise, occasioned by a clasp made of round wire.

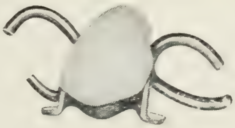
The occlusal finger-rest is an essential part of the clasp, as it keeps the clasp from pressure upon the gingivæ. Space for this rest between occluding teeth is secured by careful trimming from each tooth for its accommodation, after which the surfaces are thoroughly polished. The universal clasp used in this method may be termed the modernized three-point Bonwill clasp, which has been in use a great many years.

Another so-called prejudice—which perhaps might better be denominated fear—is that these bridges are liable to come out, and possibly be swallowed by the patient. I can assure you that such probability is very remote, as of the hundreds I have placed not one has thus far passed beyond the mouth on the alimentary route. Their retention and location are assured, and no anxiety need be felt so long as the construction and placement of the bridge is correct. These pieces are easily cared for by the patient, who can remove and replace them at will. They are also removed by the dentist during general prophylaxis treatment, properly cared for, and replaced.

One might recount a considerable number of reasons for and against this method, but actual experience seems to have eliminated the major percentage of objections in my hands, and in the further development of this method it must prove a most satisfactory means of supplying lost dental organs.

The method consists in the adaptation of different sizes and forms of gold clasp wire to meet the requirements in a given case.

The figure shows a cuspid carried by two clasps. It is thoroughly practical in the great majority of cases, but is recommended only when other attachment cannot be obtained without undue loss of good tooth structure or normal pulps. It is safe practice to use modeling compound for taking impressions if the teeth are parallel longitudinally, and not so placed as to occasion much "draw." Slight distortion may be allowed for, and sometimes the approximating tooth surfaces may be trimmed with safety. A good plaster impression, however, is preferable. After the model is mounted, the clasp wire is easily formed to the tooth surfaces, the tang or finger-rest fitted, and caught with hard wax to the clasp wire. The second clasp is formed in the same way; the backing for the interchangeable porcelain is adapted, and caught to the clasps with wax, after which the porcelain is ground to its proper position. The porcelain is then laid aside, the clasps and backing carefully removed, invested, and soldered. The framework is fitted to the teeth in the mouth, attention being given to proper occlusion of the tangs. The porcelain is then adjusted and occluded, after which the piece is removed, the porcelain cemented to place, and in from ten to fifteen minutes it is ready for the mouth. This procedure is applicable to all bridges where interchangeable teeth are used. Gutta-percha cement is well adapted for use in these cases, as, if occasion requires, the porcelain may be removed without difficulty.



More than two substitute teeth, as a rule, should not be supplied without the aid of a saddle, because of the strain upon the abutment teeth. This caution applies to fixed bridgework just the same. In some cases three teeth may be carried by this method without the aid of a saddle, where the appliance does not interfere with the natural movement of the abutment teeth in their sockets.

131 Allen st.

[See also *Discussion*, as reported under "Proceedings of Societies," this issue.]

Construction of the Gold Jacket Crown.

By CECIL B. HARRIS, D.D.S., Alameda, Cal.

THE writer's object in discussing this subject is not to add impedimenta to its already voluminous literature, but to present a technique which has in his hands proved very successful.

The construction of the gold jacket crown is a complex procedure, but fortunately the many steps are not difficult, and with sufficient attention to detail anyone can master them.

For the sake of clearness the procedure of the fitting a metallic jacket crown which I am about to describe may be divided into six steps: (1) Consideration of root to be restored. (2) Root restoration. (3) Root preparation. (4) Impressions and bite. (5) Construction of crown. (6) *a*, Toilet of root and crown; *b*, setting of crown.

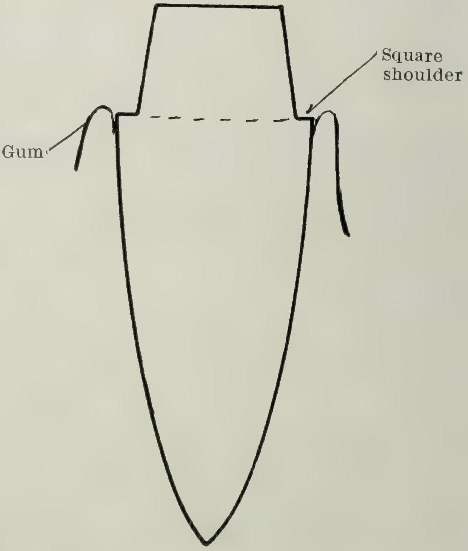
(1) Upon the condition of the root to be restored will often depend the success of the operation. It is necessary to examine the root carefully for traces of affections of the peridental membrane, carious defects, split roots, and finally, in the case of a badly broken-down root, it must be determined if there is sufficient sound tooth structure remaining upon which to build a suitable foundation for a crown. It is useless to try to make something out of nothing, and unless there is sufficient tooth structure present it is illogical to spend a lot of time and energy in placing a fine piece of work upon a faulty foundation.

(2) The root should be restored to something like its original outline by the use of amalgam or cement, or sometimes a combination of both, especially in vital teeth, or if the restoration extends rootward beyond the gum line. In restoring devitalized teeth, considerable assistance may be had by the use of anchorage pins cemented in the root-canals.

PREPARATION OF THE ROOT.

(3) The root preparation is an important step in the construction of a gold jacket crown. It is not easy to prepare a root more or less to the shape of a frustum of a cone with a shoulder around its base just under the gingiva. The writer's method is to prepare the tooth the same as for an ordinary gold shell crown, and as nearly to the shape of a frustum of a cone as possible. Then, with a carborundum disk, a cut is made the full width of the mesial surface of the tooth, being careful to maintain the flat face of the stone at the proper angle to the already cone-shaped root. The cut is made from one-half to one millimeter in thickness, down the mesial surface of the tooth to a point just under

FIG. 1.



Section of perfect bicuspid root-preparation.

the gingiva. Repeat this process on the distal aspect of the tooth with the cup-shaped disk. This requires more skill than is evidenced in the telling thereof, but with a little practice it will be found that the ledge on the mesial and distal aspects of the tooth can be almost completed with the carborundum disks in the two cuts. It now remains to complete the ledge on the labial and lingual sides. This can probably best be done by the painstaking use of cylindrical mounted carborundum points in the straight or right-angle handpiece. It will require a good deal of patience, especially in trimming off the four corners, but it can be done very nicely by the use of graduated sizes of mounted points. It is very important that the ledge be true and even and of uniform width throughout if possible, as the truer the ledge the more perfect will be the fit of the completed crown. (Fig. 1.)

TAKING THE IMPRESSION AND BITE.

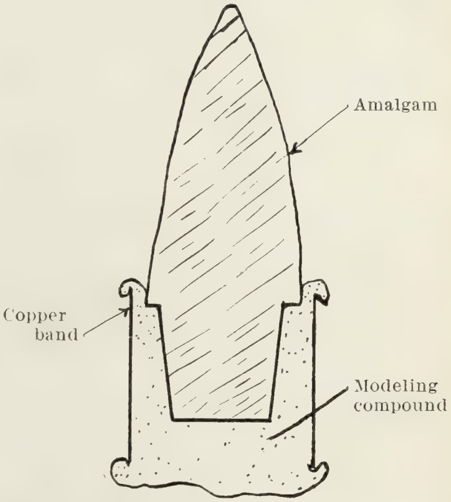
(4) It is desirable to obtain as perfect a bite as possible, including one or two teeth on each side of the tooth to be crowned. This can best be taken with a piece of good quality base-plate wax, having a sheet of tinfoil placed through its center to prevent the teeth from cutting through the wax.

Next obtain a modeling compound impression of the root and the adjoining teeth. A copper band is now selected of such a size as will just fit over the shoulder of the root preparation, and trimmed to the gingival line. This band is filled with softened modeling compound and forced into place over the root and slightly above the shoulder. If carefully done, this will give a perfect impression of the root preparation. It is advisable to slightly moisten the fingers with vaselin when forcing the copper band filled with modeling compound into place; otherwise the fingers will stick to the modeling compound, and possibly distort the impression.

Before dismissing the patient, place a cap of temporary stopping over the root preparation, pressing it firmly down upon the gum. This will keep the gum tissue from crowding over the ledge, and will enable the operator to keep the root dry when cementing the crown in place.

(5) The work from this stage until setting the crown is a laboratory process. The first step is to pour the small impression of the prepared root taken in the copper band. There are several materials which may be used for this purpose, such as cement, artificial stone, or amalgam. Of these the writer prefers copper amalgam, as it may be used over and over again if it is not too much heated in softening. When properly packed into the impression this material forms a most accurate and durable model of the root to be crowned. In the actual pouring of this model a generous portion of copper amalgam is prepared, and, beginning with small pieces, is carefully packed into the impression. It is preferable to use ball burnishers for this packing, as the writer has noticed that in using the ordinary serrated amalgam instruments they are inclined to lift the amalgam from the impression and leave imperfections in the finished model. The impression being carefully filled level-full,

FIG. 2.



Section of modeling compound impression of root-preparation poured up in amalgam.

a piece of amalgam from three-fourths to one inch in length is rolled to about the diameter of a lead pencil and carefully joined end-to-end to the amalgam filling the impression. This is shaped to form a convenient extension of the model, to facilitate its handling and to assist in placing it in the working model. (Fig. 2.)

The amalgam should be allowed to harden over night, or at least for twelve hours. It is then separated, trimmed, and the root extension portion given a thin coat of wax to facilitate its subsequent removal from the plaster model. To prevent the wax from causing the amalgam model to fit in the plaster too loosely, the wax is scraped off the model with a sharp instrument on three sides in a straight line from the ledge to the apex. The amalgam root model is now carefully placed in the modeling compound impression, which includes the adjoining teeth. This must be carefully and accurately done, and the amalgam root fastened in place with a very small amount of wax. The impression with the amalgam root in place is poured up in plaster in the ordinary manner. When the plaster has hardened, separate the impression and model and trim the model at its base so that the tip of the amalgam root will be slightly exposed through the plaster. This may best be done with a piece of fairly coarse sandpaper. The object of this is to facilitate its removal, and to enable the operator in the subsequent removing and replacing of the amalgam root in the plaster model to be sure that the amalgam root has returned to its correct position. (Fig. 3.)

The wax bite is now carefully placed in position upon the plaster model and the cast mounted in a small articulator—one permitting the lateral movements being preferred. In removing the wax from the cast after it has been mounted in the articulator, the cast must not be heated more than just enough to soften the wax; otherwise, the amalgam root-model is liable to be distorted. This precaution should also be observed in separating the plaster model containing the amalgam root from the modeling compound impression. The foregoing procedure gives us a complete articulating model in plaster of the region of the mouth containing the tooth to be crowned, with an accurate removable amalgam model of the root preparation itself.

The following step is one which the writer has found to entirely compensate for the shrinkage of the cast metal: A tinfoil false matrix is swaged over the

Fig. 3.

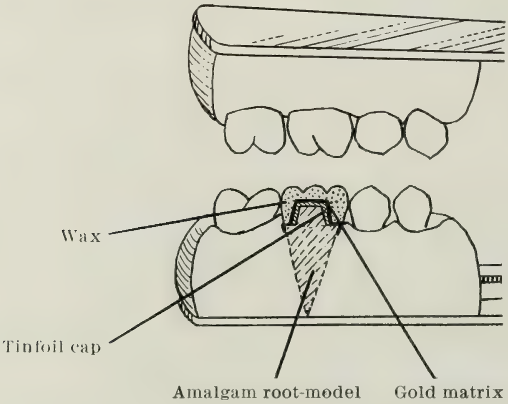


Diagram of working model, showing construction details.

amalgam model, allowing it to cover the entire root preparation. When carefully swaged into place, the tinfoil is cut away in such a manner as to leave all of the root preparation covered with the exception of the ledge. (Fig. 3.) The root model is again placed in the swager, and the tinfoil cap driven thoroughly into place.

CONSTRUCTION OF THE CROWN.

A gold matrix is now made to fit over the root preparation and its tinfoil cap, covering the entire root preparation and extending over the ledge and down the side of the root about one millimeter. The gold matrix is then carefully burnished and swaged into place, removed, trimmed, replaced in position, reswaged, and carefully removed again. A very light film of oil spread over the amalgam and tinfoil cap will facilitate removal of the gold matrix. The writer uses No. 30 cohesive gold foil for this purpose. The gold matrix is now replaced upon the amalgam model and the whole placed in the plaster articulation; carving wax is carefully flowed over the gold matrix, and carved until it accurately represents the crown of the tooth to be restored. It may be noted in passing that the crown may be made very slightly oversize, as there will be some contraction when the cast metal cools.

The carving is completed, and when the contour, articulation, and contact points are all correct, the wax is chilled and, together with the gold matrix, removed from the model, a sprue attached, and the whole carefully invested and cast. The cast must be heated very slowly to allow the large amount of wax to burn out. The writer has used many different alloys in casting these crowns, but has been most successful with 22-k. copper-gold alloy, to which is added one or two platinum pins taken from an old plate tooth. After the crown is removed from the cast the easiest way to clean it is to brush off most of the adherent investment material, and place the crown for an hour or so in a wax bottle containing hydrofluoric acid. The crown is now ready to be polished.

(6) Examine the inside of the crown carefully for any imperfections in casting, and if found to be perfect, try it on the amalgam root model, first removing the tinfoil cap. The crown should fit the model perfectly. The crown with its model is then placed in the articulating model, and the details of contour, contact, and occlusion are carefully examined. Slight defects may be corrected by grinding or filing, or flowing-on 20-k. solder if a small addition is needed.

The next step is trial of the crown in the mouth. It is sometimes necessary to make small adjustments to compensate for errors in the various steps in the construction of the crown, but usually the latter will fit perfectly in every respect without the necessity of the slightest correction.

The crown is now carefully washed in chloroform, then in alcohol, and thoroughly dried. The root is isolated as completely as possible by the aid of cotton rolls, also washed with chloroform and alcohol, and dried thoroughly with hot air. A small amount of the best quality of quick-setting cement is now prepared and placed in the crown, which is then gently but firmly forced into position, allowing the cement to set while the patient is biting upon a piece of cotton roll placed over the crown.

This is apparently a long, roundabout method of making a crown, and it does take considerably more time than is necessary for the shell crown, but the result will well repay one for the extra effort.

1500 PARK ST.

Report of the Committee on Practice—Dental Society of the State of New York.

By D. H. SQUIRE, D.D.S., Buffalo, N. Y.,
CHAIRMAN OF THE COMMITTEE.

(Read before the Dental Society of the State of New York, at its annual meeting, Rochester, May 11, 1917.)

DURING the past few years much has been said and written in regard to preventive medicine, the intimate relationship of a clean mouth to bodily health, and the necessity for its recognition by the dental profession. We have responded to the call, and have put forth oral hygiene as our slogan against the ingress of disease.

ORAL HYGIENE.

We accept this slogan as a good one, although we have only a hazy idea of what really constitutes the practice of oral hygiene, and are still undecided as to either its scope or its real worth. While this statement might be considered harsh, yet, in general terms, it is warranted by the inspection of mouths which are presented daily for dental treatment. This field is so great and is such an important factor in the efficiency of dental practice that this report will be confined to a discussion of those subjects which we believe are intimately connected with oral hygiene.

It seems to be very hard to inculcate in the mind of the general practitioner the thought of prevention of caries. The writer believes that this is due to the manner in which dentistry was presented to us in the classroom. The concept which a person primarily receives of any subject is the one which will be the most enduring, and quite naturally all of one's energies will be devoted along that particular phase of the subject. A serious mistake has been made by presenting dentistry from the standpoint of repair rather than from the standpoint of prevention, as we are taught how to fill cavities of decay, instead of how to prevent the existence of these cavities. Hence we always feel that the case is never in danger, even though the tooth tissues have been badly weakened and broken down by the inroads of decay, because we have been assured that our technical skill is quite sufficient to meet the emergency, and we do not even now fully realize the seriousness of the destruction of these tissues. If our minds had been as keenly trained along the lines of prevention as they have been in regard to reparative measures, the average dentist would be much more deeply concerned in the subject under discussion.

It may be stated at the outset that oral sepsis is an unhealthy state brought about by a multiplicity of pathologic conditions, which must be recognized and changed, in order that the laity may be protected from those lax or careless methods of dental practice which are a menace to health. There seem to be two very important items, at least, which might be considered as primal factors in a clean mouth—(*a*) education of the child, and (*b*) operative treatment.

In consideration of the first point, the principles of cleanliness should be applied very early in life—in fact, at the time of the eruption of the first teeth—and instructions given to the parents regarding the proper methods of cleansing these deciduous teeth. The child's first visit to the dentist should be made at the age of three years and should be continued at regular intervals thereafter. During these engagements lessons in the method of brushing the teeth may be taught in the operating room, so that the correct movements of the brush in cleansing all of the surfaces, the use of ribbon floss, etc., may be thoroughly instilled into the mind of the patient. This work serves as a basis for placing more responsibility on the parents, and there must be a willingness for co-operation between the parent, the child, and the dentist, in order to carry out strict hygienic treatment, and many times this trust is placed entirely in the dentist, with varying results.

This common work in which the child and the dentist are engaged will lead to the development of two very important relations between the dentist and patient—the establishment of confidence and firm friendship. A practitioner who cannot take the time to establish these sterling relationships between himself and the patient need not hope for success. The effect of prophylactic work upon the deciduous teeth is of vast importance to bodily health, as it prevents decay and possible avenues of infection through gingival irritation and pulp exposure.

OPERATIVE TREATMENT.

As to the second factor, operative treatment, this should be divided into preventive and reparative work. Preventive work includes prophylaxis and orthodontia; reparative work consists of operative and prosthetic procedures and oral surgery.

Prophylaxis is the most important agent in the prevention of decay of both the deciduous and permanent teeth, and should be thoroughly and carefully performed by the patient and the practitioner, or else referred to the specialist in this line of work. Its chief value lies in the home care which the patient gives to the teeth, and the thoroughness and regularity with which it is performed by the dentist.

Many dentists consider orthodontia as a special field of dentistry, that it pertains to occlusion, and all that this means is the alignment of the teeth. On the other hand, the orthodontist considers dentistry a branch of orthodontia, because dentistry from his viewpoint deals principally with the necessary reparative treatment of dental caries. While the dentist will not admit that this is the true relationship between orthodontia and dentistry, yet we are bound to see the reasons which prompt the orthodontist to this belief. Normal occlusion has been recognized for a long time as fundamental to the usefulness of the teeth, and to a clean and healthy mouth, yet the general practitioner often fails to realize the importance of this fact, and permits teeth to assume malpositions in the arch before referring the patient to the orthodontist for treatment.

The study of the occlusion of the deciduous teeth should begin during the period of their eruption, and the relationship of the dental arches should be carefully watched, with a view to recognizing any predisposing or exciting cause which would tend to an abnormal development of the jaws, and a consequent malocclusion of the permanent teeth. This is a most important period in the dental care of children's teeth, as a normal deciduous dentition is a great factor in establishing a normal permanent dentition. Any decrease in mesio-distal measurements of the crowns of the deciduous molars through decay or poor restorations by fillings; the shortening of the space in the molar region by the premature extraction of the teeth; or allowing habits to be formed which would constrict the arches, without compensating operative or orthodontic treatment, will disrupt the whole plan of normal occlusion, as it prevents the first molar from taking its normal position in the dental arch.

As to reparative work, the writer would first take up those procedures which have an important bearing upon the principles of mouth hygiene; namely, the preparation and filling of cavities, conservation of the dental pulp, and treatment and filling of root-canals.

CAVITY PREPARATION.

Every practitioner is aware of the unhealthy conditions and permanent injuries which are caused by the laceration of the gums and mucous membrane, in the cleaving of the attachment of the fibers of the peridental membrane during cavity preparation, and in the adjustment of separators, clamps, ligatures, etc.

The cavo-angle surface of all cavities should be laid in self-cleansing areas, so that they may be kept polished by the toothbrush and scoured by the excursions of food which passes over the margins during the process of mastication. In the building of the filling the correct shapes of the teeth should be reproduced. The writer here refers in particular to the shaping of the proximal and occlusal surfaces of the teeth, with a view to the protection of the gum in the interproximal space and the sustainment of the tooth in its proper relationship with its antagonists.

The points of proximal contact have been dwelt upon to such an extent by various writers that it seems unnecessary to discuss further their size, shape, or position, but if the proximal surfaces are not properly formed the embrasures will be such that food will pack between the teeth from their buccal, labial, and lingual sides, and cause as much irritation to the septal tissues as if the points of proximal contact were improperly made.

In the restoration of occlusal surfaces of molars and bicuspids the inharmony of occlusal restorations with the plane of the condyle path is more far-reaching in its effect upon the peridental tissues than it is upon mastication, as this misdirection of force causes an absorption of the alveolar process, accompanied by a recession of the bone and a consequent increased movement of the teeth, which is sure to lead to their ultimate disuse. Stress should be laid on the proper finishing of fillings, because masses of overhanging materials are a constant source of irritation to the gum tissue, and these irritated surfaces are likewise a constant menace to health.

CONSERVATION OF THE DENTAL PULP.

The dental profession today is face-to-face with a serious question in regard to pulp conservation versus its destruction. If we look at the matter squarely, we know that the dental pulp will degenerate eventually under its usual environment; that its function ceases after the dentin has been formed, and that improper insulation of filling materials hastens its destruction through stimulating its cells to greater activity in forming large deposits of secondary dentin for its protection.

On the other hand, care in lining all cavities, either with a balsam or a cement, will retard this process of degeneration. At the same time we are aware that, as the patient grows older and these degenerative changes take place, difficulty of access to the ends of the root-canals increases, and our chances of successful treatment decrease in proportion. It has been recommended in the past that we should take advantage of these retrogressive changes, and devitalize the pulps and fill the canals before such pathologic alterations take place, as we should then have a greater opportunity for success in the permanence of this work.

Before the days of the radiograph we did not hesitate to do this, because our technical skill had been developed to a maximum, and with the improved instruments which we had at our command we felt that this work could be successfully accomplished. At the present time, however, there is a growing sentiment against pulp devitalization, due in a large measure to the careless methods of procedure.

DESTRUCTION OF THE DENTAL PULP.

In the devitalization of the dental pulp and during the after treatment, it is the consensus of opinion that the pulp cavity must be protected from the saliva, and it is just as imperative that other sources of possible contamination should likewise be excluded. The hands cannot be made surgically sterile, and even after being scrubbed they come in contact with many unclean things, and yet they are employed in placing the cotton on the carriers, and handling the dressings, broaches, reamers, paper and gutta-percha points—in fact, everything that we use in a root-canal. Therefore in order to protect the patient from the operator's hands rubber gloves should be used during the operation of cleansing root-canals. Moreover, everything that is placed in a canal should be sterilized immediately before its use. The writer has been assured that a sterilizer for this purpose will be shortly placed upon the market. It will fill a long-felt want, because more infection is carried into the canals by the present-day methods of practice than can be destroyed by the medicaments we use.

We cannot allow the medical man to order teeth removed at will, because he is only "robbing Peter to pay Paul." It is our duty to take every precaution possible against infection so that the radiograph will show an intelligent technique and proper sterilization.

TREATMENT OF DEVITALIZED PULPS IN DECIDUOUS TEETH.

In the treatment of devitalized pulps in deciduous teeth the operator is confronted with a difficult problem, as the roots are constantly being absorbed, and the foramina are consequently so large as to preclude accuracy in filling them; and again, gutta-percha, aristol and glycerin, and euca-percha are not highly satisfactory materials for use in these cases. When such teeth are presented to us for treatment, would it not be better practice or a more healthful operation to remove them, and maintain the space by an orthodontic retainer until the eruption of the permanent teeth? In the opinion of the writer the latter course would be much less harmful to the child, and would be a nearer approach to hygienic practice.

When the pulp of a first molar becomes devitalized before the formation of the apices of the roots it should not be considered an analogous case to that of a devitalized pulp in a deciduous molar. While the conditions to be met are about the same as regards the technical procedure and treatment, still there are reasons which make the retention of the first molar paramount to everything else, and this is never true with the deciduous molar after the eruption of the first permanent molar. Palliative treatment is often necessary in order that this tooth may be retained until the second molar has taken its place in the jaw, and not until then should the first permanent molar be removed and an artificial tooth substituted.

IONIZATION OF ROOT-CANALS.

In the treatment of teeth with devitalized pulps where infection already exists, the writer wishes to refer to an article written by Prinz,* in which he sets forth the value of electro-therapy as a means of root-canal sterilization. The efficiency of chlorin is well known as a disinfectant; it is the active constituent of the Dakin formula, which is used after the Carrel method in sterilizing gunshot wounds in the hospitals abroad. Allow me to quote briefly from the article:

> The rationale of sterilizing an infected wound surface by the Carrel method is based on the following conception: "To render an infected wound sterile it is necessary to employ a suitable antiseptic in such a manner that the chosen antiseptic comes into contact with every portion of the wound; that the antiseptic is maintained in a suitable concentration throughout the entire wound, and that this constant strength is maintained for a prolonged period. If these conditions are fulfilled, every wound will show its response to the treatment by the diminution and disappearance of its micro-organisms."

Prinz says that the ionization of a one per cent. sodium chlorid solution by means of a galvanic current within a root-canal furnishes free chlorin in the nascent state, in the presence of moisture and body temperature, which is most active and well suited for our purposes.

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* "Electro-sterilization of Root-canals." DENTAL COSMOS, April 1917.

The free chlorin sterilizes the walls of the root-canals and bleaches the discolored dentin. Incidentally, the ionization of the salt water furnishes a small amount of hydrochloric acid, which acts as a superficial solvent of tooth structure and enables the operator to enlarge the root-canal more easily.

For root-canal disinfection a one per cent. solution of sodium chlorid in water is best suited, and is made by dissolving a scant teaspoonful of salt in a pint of boiled water. Prinz, by careful experiments, has worked out an equation whereby accurate knowledge in regard to complete sterilization of the surface of the average root-canal may be obtained.

Prinz says a definite relationship can be established between the strength of the current, the time of application, and the resultant sterility. He credits Zieler with noting the inter-relationship of these factors and suggesting the use of the constant *thirty* as a working basis for clinical applications. By multiplying the milliampères employed by the time in minutes used in the process of obtaining a sterile root, a number invariably was obtained which was about thirty. Hence the constant thirty may be looked upon as expressing in units the surface area of an average root-canal. In sterilizing a root-canal, a glance at the milliampèremeter will show the number of milliampères employed, and the constant thirty is divided by this number, which gives the length of time for which the current must be applied to sterilize the root.

THE METHOD OF TREATMENT.

The patient is seated in the chair and covered by a rubber apron large enough to reach over the chair arms, in order to protect him from accidental shock by grounding the current. The rubber dam is adjusted, all metallic fillings removed from the tooth, and the root-canal freed from débris by mechanical cleaning. The canal is then flooded with a one per cent. solution of sodium chlorid. The patient takes a firm hold on the negative electrode with the hand, on which there must not be rings or bracelets.

Before introducing the freshly flamed positive pole into the canal, the operator should see that the knife switch is open, and that the controller is set at zero. The needle is introduced as near to the apex of the root as possible, and the knife switch is closed. The current is very slowly turned on and the patient asked to raise the hand at the slightest sensation. Upon signal from the patient, the controller is turned slightly back, left at this point for about half a minute, and again very slowly turned forward until the patient responds again. This point Prinz has termed the "irritation point," and noting the number of milliampères employed, the amount of time necessary to sterilize the root-canal may be quickly calculated by dividing the constant thirty by this number.

After finishing the operation, the controller is slowly turned to zero, the knife switch opened, and the electrode removed from the tooth. A wisp of cotton or a cone wet with salt water is then placed in the canal and the latter is stopped with gutta-percha. The treatment should be repeated within forty-eight hours, and if necessary, again on the fifth day. As the migrating ions do not develop their maximum degree of therapeutic efficiency during the time for which the current is applied, it requires about twenty-four hours for their full activity to develop.

The clinical indications of complete sterility are a definite odor of chlorin, and the removal of a paper or cotton cone clean from the canal, after it has been sealed therein for forty-eight hours. Prinz also says that acute types of peri-apical inflammation yield readily to electro-sterilization if the salt solution and the positive electrode can reach the seat of infection. In cases of abscesses which are draining through the root-canal, the positive electrode is passed through the foramen into the abscessed cavity.

In case of an abscess with a sinus, provided the necrotic area involved is very small, it is important to first establish communication between the root-canal and the mouth of the sinus by flushing with warm salt water. The root-canal is then treated, after which the positive pole is passed into the sinus, carried along the track until the root is felt, and the negative pole, consisting of a piece of copper wire surrounded by salt water, is placed in the root-canal, and the contact made. Usually, a lower milliampèrage is used for such work. All canals should be filled immediately after the last treatment.

THE FILLING OF ROOT-CANALS.

The same precaution regarding aseptic methods of procedure in the treatment of root-canals should be employed during the filling process. Barrett, more than twenty-five years ago, said that he was convinced that there were branching canals from the main pulp cavity, and today his statement has proved to be correct. Callahan has demonstrated that these branching canals cannot be filled by direct pressure. He recommends that a balsam be introduced into the canal and carried through the apex by a pumping motion, using a gutta-percha cone as the plunger. In this manner the tubuli, the lateral canals, and the apices are sealed by the balsam and the cone. This method necessitates the enlarging of small canals sufficiently to allow the passage of a gutta-percha cone to the apex.

There are some operators who can fill root-canals exactly to the apex, others beyond the apical foramen, and still others who fill them "somewhere in France." It would appear that those operators who fill root-canals exactly to the apex will be the safest men to employ in the future;—after a few years have passed and clinical reports are published of those operations where gutta-percha cones are still waiting patiently to be encapsulated.

PROSTHESIS.

Any artificial restoration which interferes with the physiologic function of the remaining teeth and their surrounding tissue is a contributing cause to an unsanitary mouth, and is therefore productive of disease. All ill-fitting banded crowns, fixed bridgework, unbalanced anchorages for partial dentures, and above all, those substitutes which are not in proper occlusion, are a menace to a healthy mouth and must be eliminated.

In conclusion, it is quite apparent that if we would render the best service, we must introduce oral hygiene into dental practice and follow its principles as closely as we can. This means that some of us will have to change our present methods of practice; if so, let us do it immediately.

There seem to be two ways of conducting a dental practice today: First, one in which the more complex operations are performed by the practitioner, leaving the polishing of fillings, treatment and filling of root-canals, and general prophylactic work to a graduate assistant. Secondly, the limiting of the number of patients so that the dentist may do all of the operative work himself, employing a mechanic to do the laboratory work.

Many of us know by experience that there are very few practices in which a graduate assistant can do a portion of the work without complaint from the patients; yet it could be done by a competent graduate dental nurse.

In medicine, the nurse can do a great deal to assist the surgeon or physician in charge, because the patient feels that she is not taking the initiative in the work, but is following the direction of the medical man. This would be equally true in dentistry, but at the present time the dental nurse is not sufficiently educated to be a competent assistant in the general practice of dentistry. Her education is too meager, and her duties are too limited by law.

The dental nurse will do much toward solving the question of practical oral hygiene, and in anticipation of this we must go a step farther, and train her more thoroughly in the fundamental principles of dentistry. A requirement of two years of high-school work and two years of dental training would be a long step in this direction.

37 Allen st.

Studies of Internal Secretions in Their Relation to the Development and Condition of the Teeth.

5. A Summary of Miscellaneous Findings.[1]

By WILLIAM J. GIES, Ph.D., Sc.D., New York City,

AND

COLLABORATORS.

(From the Biochemical Laboratory of the Schools of Medicine and Dentistry, of Columbia University, at the College of Physicians and Surgeons, New York.)

Being the *seventh* annual report, by William J. Gies and collaborators, on investigations under the auspices of the Research Committee of the Dental Society of the State of New York, Dr. Arthur H. Merritt, chairman; and the *third* annual report on investigations under the auspices of the Scientific Foundation and Research Commission of the National Dental Association, Dr. Weston A. Price, chairman.

(Read before the Dental Society of the State of New York, at its annual meeting, Rochester, May 10, 1917.)

I.

1. At the annual meeting of our society in 1914 I reported the results of studies of effects of internal secretions from the standpoint of the REMOVAL or impairment of such secretions. We found, working on very young white rats, that extirpation of the *thymus* was without effect on dentition; and that excision of the *thyro-parathyroid* tissues was followed by very slight, if any, tendencies to diminished dental calcification.

2. At the meetings in 1915 and 1916, we reported the results of studies of effects of internal secretions, from the standpoint of the ADDITION or improvement of such secretions. We found, summing up the data of the annual reports for these two years, that dental calcification appeared to be (*a*) regularly decreased, in growing white rats, by oral administration of *lymphatic, salivary,* or *thyroid* gland; (*b*) regularly increased by oral administration of *testicle;* and (*c*) wholly unaffected by oral administration of *corpus luteum, parathyroid, pineal, pituitary, spleen, suprarenal,* or *thymus.*

There were no effects on the condition or dimensions of the teeth in any of the experiments referred to above.

Castration was also found to be devoid of influence on dentition in growing male rats.

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[1] The concluding report (abstract) of work done, by the author and his collaborators, under the auspices of the Dental Society of the State of New York, the author having resigned his directorship of research in the service of the society. These studies will be continued under the auspices of the Research Institute of the National Dental Association and of Columbia University.

This abstract is practically identical with that of the report to the National Dental Association at its recent New York meeting (to be published in the Journal of that association). The present abstract does not contain any allusion to the exhibits that were shown at that meeting.

3. At the meetings in 1915 and 1916, we reported, also, the results of preliminary experiments on related subjects (particularly results of experiments on dietary deficiencies and on additions of acid to the food, on dental and osseous calcification in rats and dogs), which, with further extensions and the addition of new themes, constitute the foundation for the findings for the current year, and of which this report is a very general statement.

4. When we reported our results at the last meeting of the society (1916), we had obtained clear and definite chemical indications that dentition is affected by certain modifications of some internal secretions, but is unaffected by various modifications of other internal secretions. Our results strongly indicated the need for a continuance of the types of experiments we had been conducting in this relation.

It is plain that, at present, the *principles* underlying the possible influences of internal secretions on dentition can be most accurately and effectively studied on laboratory animals. It is equally clear that any such *principles* that may be discovered can be most satisfactorily studied, from the standpoint of human dentition, after the nature and effects of physiological variations, in the dentition of laboratory animals, are duly recognized—after such variations are understood, and after means for their control, or for their discount, have been firmly established. Those who may be disposed to disparage such experiments as our own on laboratory animals forget that most of the *principles* of human physiology and pathology have been discovered through studies of laboratory animals, and that adequate direct experiments in our own field, on human beings, at the present stage of our knowledge of this complex subject, cannot be attempted on a humane basis.

A few dentists, who substitute fancies for facts, talk freely of the effects of internal secretions on human dentition, as if their observations were clearly based or their opinions scientifically expressed. In our own studies we have learned that the farther we proceed in this work, the more caution is required in the interpretation of the results we obtain.

II.

5. Repetition of our experiments on the effects of *thyro-parathyroidectomy* on dentition, in young white rats, has again given negative results. Removal of the *parathyroids* in such animals, however, without material disturbance of the thyroids, has been followed by deficient calcification in practically every experiment. There were no effects on the general condition or dimensions of the teeth.

These particular results indicate that our negative dental findings, after *thyro*-parathyroidectomy, have been due to mutually antagonistic (balancing) influences by thyroids and parathyroids on dentition. The results suggest that possibly the thyroids normally tend to induce *deficient* (subnormal) calcification of the teeth, and that the parathyroids normally tend to induce correspondingly *excessive* (supernormal) dental calcification.

New and more elaborate experiments are now required, by these indications, for final determination of the validity of these provisional inferences from our results. The outlook for clear and instructive findings, in such further experiments, is very promising.

6. *Physiological variation* in the composition of the teeth, in rats, is relatively slight and not great enough to account for any of the findings reported in 1914, 1915, and 1916, that were indecisive.

7. The well-known *chemical methods* we have employed in this connection during the past three years were adequate to detect significant chemical differences in dentition. Various results of uncertain import have not been due, at any time, to deficiencies in the analytic procedures as such.

III.

8. Underlying all our experiments on the effects of internal secretions is the assumption that *chemical* changes may take place, *in developing enamel,* through

the influence of substances that *originate* outside of, and enter or superficially affect the cells involved in the production of enamel. If this assumption is *unwarranted,* it is obvious that internal secretions can have no *direct* chemical effect whatever on the production or condition of enamel. If this assumption is incorrect, internal secretions can have, at most, only *indirect* or remote effects on the development of enamel.

9. That our general assumption in this regard is *correct,* however, is shown by the fact that *trypan blue* (a relatively non-toxic pigment), after its intraperitoneal injection into *young* rats, rabbits, and dogs, passes freely into the enamel of *developing* teeth, where the blue pigment seems to remain indefinitely; it does not pass from pulp through dentin into enamel of fully *erupted* teeth. The bearing of these findings on the observations by Black, and by McKay, on "mottled enamel and brown stain" is obvious, and will be discussed in a future paper. (The author is co-operating with Dr. McKay in this relation.)

10. That our general assumption in this regard is justified is shown, also, by the fact that *strontium* (a relatively non-toxic relative of calcium), after its oral administration (as the chlorid) daily for some time to *young* dogs, accumulates in the solid parts (and is present in the pulp) of the first and second sets of teeth, apparently taking the place of calcium. We have not yet determined whether strontium substitutes calcium, in such experiments, in the enamel of fully erupted teeth.

11. Experiments with *arsenic* in the forms of salvarsan and arsenite (analogous to those with strontium), in efforts to determine whether arsenic (a comparatively toxic relative of phosphorus) can displace, or associate with, phosphorus in dental calcification, have given us wholly negative results.

IV.

12. Practically all the results referred to thus far in this report were obtained on teeth *in the process of development.* It was assumed at the beginning, and has been cumulatively evident, in these experiments, that internal secretions can have little or no effect, directly or indirectly, *on the enamel of fully developed and erupted teeth* (and therefore can have little or no continuing direct bearing on the problem of caries in such teeth) unless one or more *physiological* substances can pass from pulp through dentin into normal enamel, or from oral fluids into such enamel. There is so much scientific uncertainty on the possibilities in this relation, despite the abundance of comment on the subject, that we concluded at the outset to study these problems from our own particular point of view. Results were presented in our initial report. We have lately added materially to our earlier data in this connection.

13. We find that water passes freely back and forth through all parts, including the enamel, of fully developed natural extracted teeth.

14. Simple mineral salts, such as sodium chlorid, and common organic substances, such as cane sugar, show similar ability to diffuse back and forth through fully developed natural extracted teeth.

15. In future detailed reports we shall publish the data of our numerous experiments on the gain or loss in weight of natural extracted teeth (prior or subsequent to desiccation) after immersion in various neutral media, with special reference to the passage of particular substances of physiological import back and forth through enamel and dentin.

Our results in this general relation indicate that, whether or not there is true nutritive or maintenance *metabolism* in normal enamel, there may be physiological or pathological exchange of materials in enamel by *diffusion* from blood to oral fluids, and *vice versa.*

V.

16. In the course of our study of the nature of tooth composition, from the point of view of effects of internal secretions on dentition, in their relation to

the problems of cause, control, and prevention, of dental caries, we have found that teeth contain a *glyco-protein* that is closely similar to the mucoid Gies discovered in bone, eighteen years ago, and is evidently analogous to, though not the same as, salivary mucin.

A complete study of the properties of this protein substance, which we have named *dento-mucoid,* is now in progress. We have already learned that it remains in teeth during the process of their acid decalcification. It is extractable, from decalcified teeth, with dilute alkalies. It is precipitated from such alkaline extracts by mineral acids, such as hydrochloric. It is an acid protein that forms colloidal salts. It yields reducing substance, similar to aminated glucose, after acidic hydrolysis.

This substance, which probably is localized in the dentin, may bear a significant relation to Kirk's theory pertaining to the availability of fermentable carbohydrate, within teeth, for the nutrition there of bacteria involved in caries.

The discovery of this hitherto unknown constituent of teeth is the most important single finding in our study of dental problems and has made a permanent addition to dental chemistry. We are delighted to feel that, as we close our researches under your official auspices, we have the good fortune to announce this discovery to the credit of your society, and to our efforts to serve dental science through your initiative and support.

VI.

17. These researches have been carried to completion with the earnest and effective assistance of Drs. Edgar G. Miller, Jr., Hattie L. Heft, Wm. A. Perlzweig and P. W. Punnett, and Misses Elizabeth C. Franke and Leila Noland.

18. Among the uncompleted researches in this series, now in progress, are studies of the effects, on dentition, in successive generations of rats, (*a*) of treatment with thyroid, (*b*) of unbalanced diets, and (*c*) of toxic malnutrition.

VII.

19. Reference to the work of previous observers in these relations will be published in the detailed descriptions of these several studies.

437 West 59th st.

CORRESPONDENCE

Nomenclature: The "Sixth-Year" Molar.

To the Editor of the Dental Cosmos:

Sir,—In these days of preventive dentistry much good is done by those of our profession who, turning toward the light, are resolved to inhibit the future ravages of dental disease by inculcating in themselves and their patients a proper respect for the laws of oral hygiene. It is a brief note in reference to the education of the laity that I respectfully submit to the readers of the Dental Cosmos for their criticism or approval.

It does not require a particularly observant mind to note the preponderance of decayed first permanent molars, or better perhaps, missing ones; and it is certainly wholly unnecessary to dwell on the importance of this tooth, because to most of us such a discourse would be mere reiteration. But there is an apparent fact in connection with the keystone of the dental arch, that somehow or other—at least, to my knowledge—has been overlooked. We commence with an innocent-appearing error, which may do great harm among parents, when we designate this tooth as the sixth-year molar. I have elsewhere stated, in a simplified text-book on the "Care of the Mouth and Teeth," that the chief reason for the neglect of the first permanent molar is the misconception on the part of the well-meaning mother who does not usually realize that at the age of five to six years her child may have a permanent tooth (four, in fact); but, on the other hand, she thinks that in view of its early appearance and the extreme posterior position it assumes, this molar tooth is only another "baby" tooth, and hence needs no special care—as it "must come out, anyhow," to be replaced by a more permanent one. It is only when the tooth is already decayed or a fit subject for the forceps that this unfortunate error is discovered.

Now, the point I wish to make is this: Experience teaches us that in the majority of cases the first permanent, or so-called "sixth-year," molar does not arrive at that age, but *before* the age of six; and it is this misnomer of nomenclature that only aggravates the results of the previously mentioned mistake. To my mind it would be far better to use the term first permanent molar exclusively—instead of sixth-year molar—coupled with the statement of its eruption between the age of five and six years. For then we should have true preventive dentistry, at least as far as this tooth is concerned—in that the parent would watch for its eruption at the age of five years, instead of waiting for the age of six, when in all probability it will already have been erupted and neglected, necessitating its treatment and filling at the age of seven years or its extraction shortly thereafter.

Finally, it may be argued that if a child's mouth is cared for from infancy (which it should be, but which it is not among the greater number of our people) all teeth would be preserved, irrespective of the parent's knowledge of dental anatomy. But custom fettered by ignorance plays a heavy hand, and many an anxious and even educated mother will waive all care of the deciduous set, while to allow a speck of decay in the permanent teeth would be in her mind nothing short of a crime.

Very respectfully,

J. H. Kauffmann, D.D.S.

New York City.

PROCEEDINGS OF SOCIETIES

Pennsylvania State Dental Society.

Forty-ninth Annual Meeting, held at Philadelphia, Pa., June 26, 27, and 28, 1917.

TUESDAY—*Morning Session.*

THE forty-ninth annual meeting of the Pennsylvania State Dental Society was called to order by the president, Dr. S. P. Cameron, Philadelphia, on Tuesday, June 26, 1917, 9.30 A.M., in the Clover room of the Bellevue-Stratford Hotel, Philadelphia, Pa.

Rev. N. H. G. FIFE, Philadelphia, invoked divine blessings on the deliberations of the society.

The President introduced Mr. EDWARD J. CATTELL, city statistician of Philadelphia, who welcomed the society to the city, in the absence of the mayor.

Dr. C. S. VANHORN, Bloomsburg, responded to the address of welcome.

Dr. VanHorn, the vice-president, occupied the chair while the president, Dr. SAMUEL P. CAMERON, Philadelphia, read his annual address, as follows:

President's Address.

By Dr. S. P. CAMERON, Philadelphia, Pa.

Fellow members and guests,—May I bid you a hearty welcome to the forty-ninth annual meeting of the Pennsylvania State Dental Society. Never before in our history have we been called together under such trying circumstances as the world war has brought upon us. It is difficult to realize that our giant, peace-loving nation has, within the past few months, been drawn into a bloody struggle in the cause of human rights. The country is at war, and needs your help and my help, and before this conflict is ended may perhaps call upon us to take a more active part than we have heretofore considered possible. We are facing a most serious development in the history of the world.

For more than two years we were willing to send succor to the suffering nations of Europe, supporting, supplying, and helping them by our patriotic and unselfish efforts, when suddenly we were confronted with the fact that our honor had been outraged and our patience tried beyond all endurance. We were called to war; we were called to defend our country, to fight to the bitter end of this awful struggle for our lives and the lives of all those near and dear to us, and for the liberty which our forefathers had established for us.

Let there not be one person in this audience whose soul is not touched with a spirit of patriotism for his country, and a spirit of loving-kindness for humanity all over the world. Think just for a moment of the peaceful summer days of 1914, when the International Dental Congress was in session in Europe, and how within a few hours their deliberations were broken up by a declaration of war. Our professional brothers in Europe were immediately called to arms to defend their respective countries, while members of our own society who were attending the congress had difficulty in getting out of Europe to return to their homes. From that hour the loss to the dental profession of the world has been enormous, as we were wholly unprepared for such a struggle. The burden has now fallen upon us. Let us carry forward from today our share in the cementing together of every state society and every local society, and assist as far as we can in having every dentist in the whole United States become a member of our great National Dental Association. With this unity of purpose let there be unanimous action, that there may be the unity of strength.

MEMBERSHIP IN THE NATIONAL.

The following resolution was presented to the society at its annual meeting held in Pittsburgh:

> RESOLVED, That it be obligatory upon all members of the Pennsylvania State Dental Society to become members of the National Dental Association.

The necessity of this action seems so obvious that I hesitate in infringe upon your time further than to reiterate that the federal government of this fair land of ours needs you; in fact, has asked each of you for your assistance and support. This request came through the General Medical Board of the Council of National Defense and the committees of the National Dental Association. A full report of the action and work of these committees will be found in the June issue of the *Journal of the National Dental Association.*

THE JOURNAL OF THE N. D. A.

The Journal is the culmination of the long-cherished hope of the majority of the dental profession—to own and publish a scientific monthly dental journal, in which will be recorded the proceedings of the leading dental societies all over this country. Therefore, that you may keep in touch with the activities of these various committees, and that you may enjoy studying what is being done by the active, great men of the dental profession, it is essential that you receive a copy of the Journal each month. We should all be proud of this publication, and give the editor, Dr. Otto U. King, our most enthusiastic support, as it is only through it that we shall be able to obtain a knowledge of the activities of the Research Institute of the National Dental Association. Through this institute has been created the instrument which has done most to elevate the dental profession to its present position, and is going to do more in the future to alleviate suffering humanity than I believe even Dr. Price and his associates could have hoped for when they began this work. I point with keen personal pride to the fact that I have been honored by a personal acquaintance with Dr. Weston A. Price, the head of the Research Institute. For the indefatigable work he has done, for what his noble efforts have accomplished, he must be regarded as one of God's noblemen.

RESEARCH INSTITUTE OF THE N. D. A.

To quote from its literature—

> The splendid researches on dental subjects, which have been conducted in nine different cities by the Research department of the National Dental Association, have been sustained by individual pledges, made on the basis of five annual payments. The early pledges have now run out, and the future of the work requires that, as soon as possible, a more permanent and adequate support be provided. The pledge plan has not been equitable, because with it a few men have had to carry the burden for the dental profession. With the adoption of the new plan the immature payments on pledges may be terminated or continued, as individually desired.
>
> Approximately 75 per cent. of the membership of the National Dental Association have now taken favorable action on this universal one-dollar-per-member plan for the support of the researches, to be paid with the dues to the state, and by the state officers to the treasurer of the Research department. It is expected the plan will be universally adopted very soon. Michigan, Illinois, New York, Indiana, Missouri, Louisiana, and Southern

California have recently taken favorable action.

Can we not ask that the same action be taken in the great Keystone State as has been taken in several of the other states, and that by a unanimous vote we set aside the constitution and by-laws and become a component society of the National Dental Association? Such membership will carry with it an increase of two dollars in the annual dues. one dollar for the *Journal of the National Dental Association,* and one dollar for the support of the research work of the Research Institute of the National Dental Association. I sincerely hope that there will be not a single dissenting vote to such a resolution when presented for your action. I would also recommend that we make a contribution from the treasury of the society of $2000 toward the building fund of the National Research Institute. In all these years we have, as a society, done nothing toward the support of the Research Institute—the building fund or the research work of the institute. The policy and purpose of the department are to establish and maintain researches in as many different states as possible where skilled men competent to direct the work are available, and to secure an adequate endowment for carrying on the study of special problems in the institute. The war situation will, of necessity, delay the consummation of the endowment, and, in the meantime, the dental profession must maintain the work with all the more zeal.

THE DENTAL HYGIENIST.

For several years I have been much interested in the question of the dental nurse. I was keenly disappointed when this important question did not receive more favorable consideration when presented to you by your former president, Dr. Howard S. Seip. The tremendous need for trained operators for the surface treatment of the teeth and the carrying out of dental oral prophylaxis in the schools and institutions of our country is self-evident, and needs no argument with those who have given any attention at all to the situation and its involved needs. The number of dental practitioners in America is wholly inadequate to deal with the prevention of dental diseases and the consequent mental and physical inefficiency of our school children. I have been much impressed with this fact in caring for the children in Girard College for the past six years. During the first and second years after the opening of the dental department of Girard College the number of cases requiring treatment in the medical infirmary was reduced by such an appreciable percentage that it became a matter of comment in the reports, not only of the medical supervisors, but also of other executive officers of the college. Government and state statistics have revealed the deplorable fact that about 70 per cent. of the manhood of the American nation is disqualified for national defense by reason of dental defects or disorders arising therefrom. Further investigation has shown that the mental and physical retardation of school children and the maintenance of defective children of school age in segregated institutions impose an enormous burden on the taxpayer. It is also a well-known fact that a large percentage of the mental and physical defects of school children are due primarily to remediable dental disorders. The distinctly reparative work done by the dental profession is insufficient to meet, and does not touch upon, the larger and more important antecedent question of the prevention of dental disorders, a work which, in the nature of the case, must begin with the children.

Inasmuch as dental practitioners as a whole are unable to successfully meet this larger demand for preventive dentistry, some provision such as the training and licensing of a class of operators competent in skill and in numbers to adequately meet the situation and to bring the benefits of oral prophylaxis practically within the reach of our school children is clearly necessary. Connecticut, Massachusetts, and New York have provided by legislative enactment for licensing the dental hygienist—a most practical way in which to cope with the difficulty here under consideration. Illinois has a similar bill before its legislature at the present time.

Various objections have been raised by members of the dental profession here and there against this forward step. The principal objection seems to be that the dental hygienist, if licensed to do certain kinds of work upon the teeth, could not be limited to that field, but would enlarge her field and entrench upon that of the regular licensed dental practitioner; and that such a tendency would give rise to multiplied infractions of the dental law.

That you may have an intelligent working idea, I wish to submit herewith a tentative plan of procedure, subject to such further amendments and qualifications as you, in your judgment, may deem advisable:

TENTATIVE SUGGESTION FOR LEGISLATION.

A legally qualified and licensed practitioner of Dentistry in the State of Pennsylvania may employ a woman assistant or assistants legally qualified and licensed as hereinafter provided for, which assistants shall be known as dental hygienists. The dental hygienist may remove all tartar deposits, accretions, and stains from the exposed surfaces of the teeth, and directly beneath the free margins of the gums, but shall not perform any other operation on the teeth or mouth, or on any diseased tissues of the mouth. The dental hygienist may operate in the office of a duly qualified and licensed dentist, or in public or private institutions, such as schools, hospitals, orphan asylums, and sanitariums, under the general supervision of a licensed and qualified dentist, but not otherwise.

The Dental Council may revoke the license of any registered dentist who shall permit any dental hygienist operating under his general supervision to perform any operation other than that permitted by this section.

Any woman not less than twenty years of age, of good moral character, who has received a competent school education as specified in this act, and upon presentation of a certificate or diploma from a chartered and reputable dental educational institution recognized as of good repute by the Dental Council of Pennsylvania certifying that the holder thereof has successfully pursued in such institution a course of instruction in subjects approved by the Dental Council as essential to the proper education and training of a dental hygienist; upon payment of ten dollars and the presentation of satisfactory certificates as to character and education, may be examined by the Board of Dental Examiners, under the conditions and regulations prescribed in Section IV of this act for the conduct of examinations and recording the results thereof of candidates for the license to practice dentistry in Pennsylvania in subjects deemed essential by the Dental Council for the proper training of a dental hygienist. The results of the examination of persons provided for in this section shall be transmitted to the Dental Council as provided in Section IV of this act, and upon receiving from the Board of Dental Examiners a report of the examinations for license of any applicant who shall have been returned as having successfully passed said examinations, the Dental Council shall issue to such applicant a license to practice as a dental hygienist in the State of Pennsylvania.

Any unlicensed person who shall perform any of the operations specified in this section as pertaining to the work of a dental hygienist, shall be deemed to be practicing dentistry within the meaning of this act and shall be subject to the penalties provided in Section VIII of this act for such unlicensed practice.

At the present time, the number of dentists in this country is wholly inadequate to care for the needs of the school children alone. The Government has asked the Committee on National Defense to supply one thousand dentists for the army and navy. Assuming that a dentist can take care of 350 patients per year, this would deprive 350,000 more of our children of the possibility of dental services. Since this licensing of the dental hygienist was presented to you by my predecessor, Dr. Seip, the necessity for your careful consideration has greatly increased. I beg leave to ask that you direct your attention to an analysis of this subject from the standpoint of the large public good that can be accomplished from an educational standpoint as well as in the conservation of the health of our future citizens.

CHANGE OF DATE OF ANNUAL MEETING.

May I ask your further consideration of some essential features which should tend to increase the efficiency of our own State Society? On numerous occasions your presidents have addressed you asking that steps be taken to change our time of meeting. Our charter provides that the meeting be held within the calendar month following the first Tuesday in June. The only objection that has been brought forward is that we have a very liberal charter, and that application to the state legislature for a change might be detrimental. The charter was granted in 1868, and I have been advised that the laws have been so changed in the past forty-nine years that the same conditions under which our charter was granted are not applicable at present. The time of meeting can be changed by making application to the Governor of the commonwealth.

You will agree with me that we have been always accorded the most courteous consideration in our dealings with the state legislature. Why should we, as a body of scientific professional men, not be allowed equal privileges with other professional associations. Let me suggest, therefore, that an application be presented to the Governor of Pennsylvania asking that Section VI of our charter relative to time of meeting be changed so as to read: "The meeting of the Pennsylvania State Dental Society shall be held annually." Accomplishing this change at as early a date as possible, we could then hold our next annual meeting at a more propitious time, perhaps about the first week in April—a time when every professional man needs a change from the long winter's work. Our next annual meeting will be our fiftieth anniversary, and we should have a whole week's celebration, considering what has been accomplished in the growth and development of dentistry and the part we take today in the conservation of life and health. Let us celebrate our fiftieth anniversary with at least 2000 members.

I would recommend that the last sentence of Sections 3 and 4, Article II of our by-laws, relative to the recording secretary and treasurer giving a bond in the sum required by Council be stricken out, or that Council be instructed to carry out such a by-law. It has never been operative.

A HOUSE OF DELEGATES FOR THE STATE SOCIETY.

It has previously been suggested to you that delegates from each component society be sent to the State Society, and that they conduct all of the business of the society in conjunction with Council, such delegates to be known as the House of Delegates. This seems to be an admirable plan, and therefore I ask that the representatives of the various component societies have a meeting following this session, form an organization, and present properly drawn resolutions to this society so that they can be acted upon at our next annual meeting, and also that they have this plan formulated into our by-laws. If such a plan is acceptable to the representatives of the various component societies, I see no reason why it could not be put into effect at our next annual meeting. Favorable action by the State Society would be a necessity. In the interim before our meeting a great deal of good work could be done in getting new members. Each component society should be represented by at least one delegate for every fifty members.

* * * * *

THE PREPAREDNESS LEAGUE OF AMERICAN DENTISTS.

About a year and a half ago, Dr. J. W. Beach of Buffalo, New York, and his associates formed an organization which is known as the Preparedness League of American Dentists, its purpose being to prepare its members, by organization and training, to render the most efficient service in dental surgery to our country in preparing for war. The recent growth of the League has been worthy of Dr. Beach's efforts, and I believe every member of the dental profession should be a member of the League.

The aim of the League is twofold: First, the preparing of recruits for enlistment; second, the forming of many study clubs all over the country from which an educational advantage will be gained for both the profession and the public. A detailed report of the work will be found in the *Journal of the National Dental Association,* which I would recommend you to read carefully, so as to become familiar with this important work.

THE G. V. BLACK MEMORIAL.

Early in November each of you received a communication from Dr. W. H. G. Logan, chairman of the G. V. Black Memorial Committee. The returns from that communication have been so small, considering all the ardent admirers Dr. Black had in Pennsylvania, that I take this opportunity to ask you to make your individual pledges at as early a date as possible. I have no doubt that many of you would like to make small contributions. Aside from these, I would suggest that we contribute $200 from the treasury of our society to the G. V. Black memorial. Other state societies have contributed even more liberally.

During his activities as chairman of the Clinic Committee, Dr. Edwin Shoemaker was called to the service of his country in France, and is now connected with base hospital No. 10 in a dental capacity. May I ask you to instruct the secretary of the society to forward by cablegram our thanks and appreciation for the work he did in assisting in the preparation of the program of this meeting, as well as our best wishes for his welfare and an early return to his home?

I wish to thank Dr. L. Biddle Duffield for taking up Dr. Shoemaker's work and carrying it forward with such enthusiasm.

I take this opportunity of extending my hearty thanks to the members of the several committees and officers of this society, who during the past year have been untiring in their efforts to make this meeting a success.

To you, the members of the Pennsylvania State Dental Society, I wish to express my heartiest thanks for electing me to this high honor, and to assure you of a full appreciation on my part of all the responsibilities which such an honor has involved.

On motion of Dr. H. S. SEIP, Allentown, the following committee was appointed by Dr. VanHorn to consider the recommendations contained in the President's Address and report at a later session: Dr. W. D. DeLong, Reading; Dr. W. H. Fundenberg, Pittsburgh, and Dr. A. E. Bull, Wilkes-Barre.

The society then adjourned until the afternoon meeting.

TUESDAY—*Afternoon Session.*

The meeting was called to order at 3 P.M. by the president, Dr. Cameron, who called for the reading of the minutes of the previous meeting. On motion of Dr. DELONG, this was dispensed with.

The report of the Publication Committee having been asked for, Dr. J. F. BIDDLE, Pittsburgh, the chairman, stated that as the Proceedings had been published and delivered to the members, the committee had no further report to make.

Dr. L. M. WEAVER, Philadelphia, chairman of the Exhibit Committee, reported for the committee as follows: *Mr. President,*—The report of the Exhibit Committee is the exhibit. We have labored in season and out of season to produce what you see. We feel that we have produced the best exhibit the society has ever had, and it is each member's duty to give some time and attention to it, so that when we have another meeting the exhibitors will come back and give us another show.

The next order of business was the report of Committee on Enforcement of the Dental Law.

In the absence of Dr. A. E. Bull, Wilkes-Barre, chairman of the committee, Dr. A. H. Reynolds, Philadelphia, a member of the committee, stated that the report had been published in the *Bulletin,* and contained the itemized account and financial statement of the committee, but since that report had been published some work had been done, particularly in the western part of the state.

The report of the Committee on Oral Hygiene and Public School Dental Education was called for, and Dr. H. W. Bohn, Reading, chairman of the committee, presented the following

Report of Committee on Oral Hygiene and Public School Dental Education.

Last October your committee sent a circular letter to the secretaries of all the component societies of the State Society. The letter set forth in emphatic terms the importance of public dental education, especially in the light of recent investigations and discoveries bearing upon the relation of foci of infection due to devitalized teeth.

It was pointed out that the best way to combat this evil was through public dental education bearing on this fact. The secretaries were urged to bring this matter before their respective societies, and ask for immediate action.

Your committee received two replies, one of which was from the Reading Dental Society, of which your chairman is a member, and the second from the Erie Dental Society.

On April 25th another circular letter was sent, again urging action along the line of public dental education. To this a few replies were received, but no action. Considerable work, however, was done by some of the members of this committee and individual members of the State Society. The society is of course aware of the fact that last year's committee purchased a set of slides and manuscript, to be used in a campaign of public dental education. The slides were exhibited and the lecture delivered in the following cities and towns: Chester, Reading, Erie, Carlisle, Hershey, Johnstown, and Allentown, the audiences totaling about fifteen thousand, mostly school children above the sixth grade.

Recently a third circular letter was sent to all the component society secretaries requesting a report of the activities of their societies during the past year along the line of oral hygiene and public dental education.

Following are the reports from the various societies:

The Odontological Society of Western Pennsylvania, King S. Perry, secretary, made no report.

The Reading Dental Society reports: The slides were exhibited and the lecture delivered to about six thousand school children, from the sixth grade up and including both high schools; also the nurses of the Reading Hospital and the Woman's Club. Apart from this a series of lectures were given to the nurses of the Catholic Hospital.

The lecture was also delivered to the school children and residents of Hershey by the resident member of the committee. The public school dispensary, now under the auspices of the Reading school district, is still being supervised by a dispensary board elected from the membership of the Reading Dental Society. The same board conducts two free dental dispensaries, viz, one at the Home for Friendless Children, and one at St. Catherine Orphans' Home.

For the York Odontological Society Dr. W. A. Pennington, secretary, reports: We have done nothing during the past year but try to get the school board to put a clinic in the schools, and have not found them in a very receptive mood. At present we are "marking time" and waiting until next year, when some of the opposition will have dropped out. We have hopes of then being more successful.

Lycoming Dental Society, through its secretary, B. B. Sprout, reports as follows: When I tell you that at the last three meetings of the Lycoming Society the attendance did not make up a quorum, and therefore we have been unable to hold an election of officers for this year, you will be able to guess why there is no report on your subject inclosed herewith.

The few contributing members seem to think the payment of dues is all that is required of them.

Luzerne and Lackawanna Dental Society, H. D. Matten secretary: Our society is maintaining infirmaries in the City Hospital, also Mercy Hospital, and concentrated efforts are being made with the medical profession toward better oral hygiene and public dental education.

Lake Erie Dental Association, D. S. Sterrett, secretary, reports: The only oral hygiene and public dental education reported at the recent meeting of the Lake Erie Dental Association was from the committee in Erie, Pa. They gave an account of something like ten lectures, given before the parent-teachers association in our public schools, using the manuscript and slides provided by your committee, and the results were so satisfactory that a similar plan will be considered for the coming year.

It was the consensus of opinion that if we are to believe and take to heart all we are hearing and seeing demonstrated about root-canal infection, the only solution will be efficient and sufficient public dental education for the benefit of the children of the coming generation.

I would like to be notified of the plans of the State Oral Hygiene Committee for the coming year.

Central Pennsylvania Dental Society, through H. C. Lovell, secretary, reports: I am rather ashamed of our report for this year which is as follows: Johnstown had the films and lecture for two performances in May. These were the only times they were shown in this district, to the best of my knowledge. The proceeds were $3.25.

Pennsylvania Association of Dental Surgeons, W. H. T. Collins, secretary: No report.

Harris Dental Society, E. A. Devine, secretary, no report.

Harrisburg Dental Society, W. B. Mausteller, secretary: The Harrisburg Dental Society has done nothing along the line of oral hygiene and public dental education during the past year. The school authorities have undertaken the dental inspection of the school children and established a dental clinic without accepting the co-operation of the dental society.

For Chester and Delaware County Dental Society, P. C. Hollis Lapp, secretary, reports as follows: Each county has a committee. We have two committees on the work and I have referred the matter to them and asked them to report to you at once, through the chairmen—Dr. A. Ross Crane for Chester county and Dr. S. B. Luckie for Delaware county.

The letter you wrote in reference to slides and lecture was received just after our last meeting. The offer which you spoke of being made last October must have gone to our former secretary, and I think Delaware county made use of the lectures and slides. In Chester county we have had a number of chairmen, but not much done.

No report came from chairman A. Ross Crane for Chester.

The following report was received from Dr. S. B. Luckie for Delaware county: There have been nineteen talks on oral hygiene given in Delaware county. Eighteen of these were given to school children, numbering nearly two thousand. Eleven were given in the city of Chester, and some in schools throughout the county. One talk before the senior gymnasium class of the Y. M. C. A. Other talks were partially arranged for, but were not completed, through no fault of the committee, and will probably be given later. The clinic for children under fourteen years of age is being continued at the Chester Hospital. The society now has a lantern, equipped either for electricity or acetylene; so the good work ought to go on in town and hamlet.

Beaver Valley Dental Society, H. C. Wertz, secretary: We have discussed the subject, but have not so far taken any action.

Schuylkill County Dental Society, R. S. Glass, secretary: No report.

W. I. Zyner, secretary, reports as follows for Lehigh Valley Dental Society: So far as I know our society, whose members are pretty well spread over a large area, have not been very active along the line of oral hygiene and public dental education. Our members in Allentown showed the slides in the High School Building during the week of our Susquehanna meeting, and I understand met with good success.

I do not know of any other towns that took up the work. Each one of our Lehigh Valley members has been supplied with a little pamphlet entitled "A Clean Mouth and a Real Reason for Keeping It Clean." These have been distributed to our patients for the last few years.

Academy of Stomatology of Philadelphia, W. S. Hewitt, secretary, reports as follows. Dr. S. B. Luckie of Chester is the local chairman of the Oral Hygiene Committee, and he possibly could give you more definite information. After several years of effort we managed to get city council to appoint regular dentists on salary to care for this work. As these men make a business of caring for school children, it probably is more efficiently done than is volunteer work. I do not know whether any lectures are being given to school children, but I understand that this is part of their work.

Odontographic Society of West Philadelphia, C. H. Chain, secretary: I do not know of any work the society has done along these lines.

Eastern Dental Society of Philadelphia, J. J. Coltune, secretary: The membership of this society render their services to charitable institutions. We will take up the work of oral hygiene and public dental education for the coming year.

North Philadelphia Association of Dental Surgeons, Warren Matlack, secretary: No report.

From the above reports it is noticeable that activities along the line of public dental education in the capital city of dentistry, viz, Philadelphia, are almost entirely lacking.

This is regrettable. May we not hope to see the district societies lead another year?

It has been suggested by one of the members of your committee that we connect our public dental education work with that of the state Health exhibit. We have written to its chairman with that end in view, but have not received any reply.

This year's experience has demonstrated that if this work is to be taken up generally all through the state, one set of slides and manuscript will not be sufficient. A good plan would be for each component society to own a set, which would give it the liberty to use it when and as often as convenient. The local committees could confer with the central committee whenever necessary or desirable.

The financial report is as follows:

Receipts.

Balance from Dr. S. B. Luckie	$ 4.40
Proceeds from rental of slides	23.50
	$27.90

Expenditures.

Additional slides	$ 3.43
Postage, typewriting, telephone, and stationery	17.24
	$20.67

Receipts	$27.90
Expenditures	20.67
Balance	$7.23

No funds were received from the society treasurer.

Respectfully submitted,
H. W. Bohn, *Chairman.*

On motion, duly seconded and carried, this report was accepted and ordered entered in the minutes.

The reports of the Committee on Registration and of the Dental Examining Board were read by Dr. A. H. Reynolds, Philadelphia, secretary of the board.

These reports were accepted and ordered entered in the minutes.

Dr. Cameron next called for the report of the Committee on Dental Science and Literature. Dr. C. R. Scholl, Reading, the chairman of the committee, presented the following

Report of the Committee on Dental Science and Literature.

In submitting this report the committee does so with much reluctance, because of the great scope of the work, being more in doubt as to what to omit than as to what to include in the report. We have therefore only noted original communications appearing in the dental journals since July 1916, publications and facts of historic value, and a few inventions.

There are a number of continued articles and discussions of papers appearing prior to the above date that are worthy of note and careful reading, especially the articles on "War Surgery" by Dr. Geo. B. Hayes, beginning in the Dental Cosmos for March 1916.

The article "More About the Old Age Fund," by "A. H." in the *Dental Digest* for January 1917 is also worthy of particular note.

The committee would admonish the younger practitioners in particular to subscribe to the dental journals as soon as they enter upon their life-work, and to not only carefully peruse their pages but file the issues as a nucleus for a library of reference.

* * * * *

Respectfully submitted,
C. R. Scholl, *Chairman.*

The report of the Treasurer was read by Dr. A. B. Miller, Kingston.

On motion, duly seconded and carried, the report was accepted and referred to an Auditing Committee to be appointed by the president.

Dr. Cameron appointed as the Auditing Committee the following: Dr. C. V. Kratzer, Reading; Dr. P. C. Lapp, Malvern, and Dr. F. A. Fox, Philadelphia.

The report of the Secretary was read by Dr. J. F. Biddle, Pittsburgh, recording secretary of the society, as follows:

Report of the Secretary.

The growth of the Pennsylvania State Dental Society during the past year, while not all that could be desired when one considers that Pennsylvania has more than 3600 registered dentists, is nevertheless encouraging, as the report shows 1223 members to date, which is an increase of 174 members over the last annual report. Of this number 957 are members of the National Dental Association, which is an increase of 160.

The number of component societies which make it obligatory that their members be members also of the National Dental Association is steadily increasing, until now this rule is enforced in more than half of the component societies. It is hoped, therefore, that when this question is presented to our membership for their consideration it shall receive the support it unquestionably merits.

The amendment to increase the State Society dues one dollar, to be devoted to work of the National Research Institute, also deserves our hearty support, and has already been indorsed by two of our largest component societies.

During the year the resignations of Drs. E. C. Kirk and M. H. Cryer of Philadelphia have been received. In view of their long activity in dentistry and their years of service in this society, their names should be placed upon our honorary roll of membership.

The application for membership as a component society, of the Germantown Dental Society has been received, and will be submitted to the Council for their indorsement.

J. F. BIDDLE, *Sec'y.*

The report of the Secretary was received and ordered to be entered in the minutes.

Following the suggestion contained in the report, Dr. T. A. Hogan, Pittsburgh, moved that the names of Dr. M. H. Cryer and Dr. E. C. Kirk of Philadelphia be placed on the honorary roll of membership of the society. (Motion seconded and carried.)

The next item on the program was a paper by Dr. LOUIS MEISBURGER, Buffalo, N. Y., entitled "Oral Prophylaxis and Periodontoclasia."

[This paper was printed in full at page 985 of the October issue of the DENTAL COSMOS.]

On motion of Dr. G. S. Schlegel, Reading, a vote of thanks was given to Dr. Meisburger for his interesting paper.

The President then introduced Mr. IRVING L. BROWN, general secretary of the Dentists' Mutual Protective Alliance, Chicago, Ill., who made a short address explaining the reasons for the formation of that organization and the advantages to every dentist in becoming a member.

In connection with the subject of Mr. Brown's address, Dr. T. W. MCFADDEN, Wilkinsburg, presented the following resolution:

Whereas, the sentiment of this meeting is against process patent exploitation, and

Whereas, the Dentists' Mutual Protective Alliance is an organization whose purpose is to protect its members against process patents and other abuses; therefore be it

RESOLVED, That we, the members in attendance, indorse the work of the Alliance, and give it our moral support.

On motion of Dr. OTTO E. INGLIS, Philadelphia, the matter was referred to the Council, to report at a subsequent session.

The Auditing Committee reported that the accounts of the treasurer had been examined and found to be correct.

On motion of Dr. W. A. Spencer, Carbondale, the report was accepted and the committee discharged.

The society then adjourned until the evening session.

TUESDAY—*Evening Session.*

The meeting was called to order by the president, Dr. Cameron, at 8 P.M.

Dr. Cameron introduced Dr. R. OTTOLENGUI of New York City, the essayist of the evening, who gave an extemporaneous lecture on "The Management of Infected Teeth, Including the Technique of Root-canal Work, Root Amputation, and Ionization."

A motion to extend a vote of thanks to Dr. Ottolengui was made and carried.

Adjourned until the Wednesday morning session.

WEDNESDAY—*Morning Session.*

The meeting was called to order by the president, Dr. Cameron, at 10 A.M.

The first item on the program for the morning session was a paper by Dr. PERCY R. HOWE, Boston, Mass., entitled "A Study of the Micro-organisms of Dental Caries."

[This paper was printed in full at page 961 of the October issue of the DENTAL COSMOS.]

Dr. HOWE also presented in the form of a lecture the substance of his paper in the DENTAL COSMOS entitled "A Method of Sterilizing, and at the Same Time Impregnating with a Metal, Affected Dentinal Tissue."

[See September issue of the DENTAL COSMOS, page 891.]

ELECTION OF OFFICERS.

The society then took up the special order of business set for 11 o'clock, the election of officers for the ensuing year. The result was as follows:

President—Dr. C. S. VanHorn, Bloomsburg.

First Vice-president—Dr. W. A. Spencer, Carbondale.

Second Vice-president—Dr. G. S. Schlegel, Reading.

Recording Secretary—Dr. J. F. Biddle, Pittsburgh.

Corresponding Secretary—Dr. O. J. Specker, Reading.

Treasurer—Dr. A. B. Miller, Kingston.

Board of Censors—Dr. K. S. Perry, Pittsburgh; Dr. W. Sterling Hewitt, Philadelphia; Dr. E. S. Filbert, Pottsville; Dr. B. B. Sprout, Williamsport, and Dr. P. C. Lapp, Malvern.

Executive Council—Dr. H. D. Matten, Wilkes-Barre; Dr. J. C. Hipple, Pittsburgh, and Dr. E. R. Sausser, Philadelphia.

Nominations for Board of Examiners—Dr. W. D. DeLong, Reading; Dr. J. D. Whiteman, Mercer; Dr. A. P. Lee, Philadelphia, and Dr. Victor Cochran, Philadelphia.

Dr. Jesse C. Green of West Chester, who was present at the age of one hundred years, was called on by the president to say a few words.

All rose in honor of Dr. Green and the splendid work he had done during his life.

The report of the Council was read by the secretary.

On motion, duly seconded, the report was received and filed.

Report of Committee on Necrology.

The report of the Committee on Necrology was read by the Secretary, for Dr. W. H. TRUEMAN, Philadelphia, chairman, as follows:

Mr. President and members of the Pennsylvania State Dental Society,—Your Committee on Necrology with deep sorrow report the death, since our last meeting, of four active and prominent members—Drs. James G. Lane, George W. Klump, P. K. Filbert, and William M. Wright.

Dr. Klump became a member of this society at its fourth annual meeting, 1872, and for many years took an active part in its affairs, and also in the affairs of the profession in this state, and has served for some years on this committee.

Dr. Filbert, an ex-president, has a record of many years active and useful work in advancing the society's and the profession's interests.

Dr. Lane will be remembered for his active and judicious work in bringing about, so successfully, the reorganization of the profession in Pennsylvania that has strengthened and so greatly increased the usefulness of the State Society. His mechanical skill, his energy and ability in solving professional problems, his contributions to dental literature, and his readiness in debate to grasp ideas, and to frame his views in well-chosen and expressive words, were appreciated accomplishments.

Dr. Wright was one of our younger members. He was a zealous student of dentistry, an operator of unusual ability, whose mental qualities and pleasing personality gave promise of a successful career.

We also record with regret the death during the year of Dr. Luther Campbell of Slatington, an honored member of our society.

RESOLVED, That we record in the society's minute-book our appreciation of their worth, and our sympathy with their loved ones who mourn their loss.

WILLIAM H. TRUEMAN,
W. H. SCHOLL,
Committee.

It was moved that the report of the Committee on Necrology be received and entered in the minutes. (Motion seconded and carried.)

The society then adjourned until Wednesday afternoon.

WEDNESDAY—*Afternoon Session.*

The meeting was called to order by the president, Dr. Cameron, at 2.30 P.M.

The first paper of the morning session was entitled "Oral Hygiene—Prophylaxis—Restoration: The Triple Alliance," by Dr. **JAMES K. BURGESS**, New York City.

[This paper is printed in full at page 1208 of the present issue of the DENTAL COSMOS.]

A brief lecture on "Fractures" was given by Dr. **LOUIS G. GRACE**, of Girard College, Philadelphia, who illustrated his remarks with lantern slides.

A vote of thanks was given to Dr. Burgess and Dr. Grace.

The minutes of the Council were read by the secretary.

On motion the minutes of the Council were accepted.

The report of the Committee on President's Address was read by Dr. DELONG, as follows:

Report of Committee on President's Address.

We, the committee to whom the President's address was referred, beg leave to report as follows: We approve of the President's recommendation that our By-laws be so amended as to provide for component membership of the Pennsylvania Dental Society in the National Dental Association.

Your committee is not agreed as to the advisability of increasing the dues of this society at the present time, but suggests that this matter be discussed in open meeting. We approve of the recommendation of the President that appropriations be made to the Research Institute of the National Dental Association, and suggest that the Council make annual appropriations of such amounts as the financial condition of the society may warrant, to be used for research work only.

We agree with the President's statements as to the need for the dental nurse under proper restrictions, and suggest that the Legislative Committee be instructed to draft a bill and present it at the next meeting of this society.

We concur in the recommendation of the President that the time of meeting of this body should be changed, if it can be done without impairing the value and functions of our present charter.

We indorse the recommendation of the President that next year's meeting, the fiftieth anniversary of this society, should be made a memorable one.

In reference to the bonding of the recording secretary and treasurer, we advise that Council carry out sections 3 and 4 of Article II of our By-laws, and that the expenses of bonding be paid by the society.

We indorse the recommendation of the President as to the establishment of a House of Delegates composed of representatives of the component societies.

We indorse the suggestion that a Membership Committee on State Organization be formed, composed of the officers of the various component societies, and that the By-laws be so changed or amended as to cover the objects specified in the President's address.

We are in harmony with the President's recommendation that the president, vice-president, and recording secretary be included in the list of delegates to the National Dental Association.

We approve the suggestion that a cablegram be sent to Dr. Shoemaker and his associates.

Respectfully submitted,
A. E. BULL,
W. H. FUNDENBERG,
W. D. DELONG,
Committee.

During the reading of this report, the chair was occupied by the first vice-president, Dr. VanHorn. It was moved that the report be received, and the committee discharged. (Motion seconded and carried.)

Dr. H. S. SEIP, Allentown, moved that the discussion on the question of increasing the dues be taken up. (Motion seconded and carried.)

Dr. Cameron asked the secretary to read a resolution presented by Dr. Weaver at the meeting of the society in

Pittsburgh in 1916, which had been carried over to be acted on at the present meeting.

Dr. BIDDLE read the resolution, viz:

> RESOLVED, That an amendment to cover the subscription of one dollar per member to the National Research Institute be printed in the Proceedings, and come up for action at the next annual meeting.

Dr. SEIP made a motion that Dr. Weston A. Price be asked to explain the matter. (Seconded and carried.)

Dr. PRICE explained the urgent need of immediate action, and said the work that should have been carried by twenty thousand men had been carried by two thousand men for five years. He said that endowments could not be obtained until there was an organization with a permanent headquarters fitted to receive it. He also stated that a competent research organization must have an adequate income, must have a principal place of doing business, and must be organized according to law. Money, he said, was given to various experts in different university centers to carry on research work. Dr. Price, in answer to a question, stated that this money would be used for research work only, and that if the society made a contribution toward the building fund, it would be a separate thing. He further said that the building was a fine one containing thirty rooms, and that it had cost only $50,000, although the tax appraisers valued the property at $68,600. He considered it a good investment, and said that the property was increasing in value at the rate of ten per cent. a year.

The building contained about ten or twelve thousand dollars' worth of equipment, half of which had been donated, and the other half paid for by funds that had come from outside of the contributions of dentists. The debt still remaining on the property was $32,500.

Dr. SEIP made a motion that the By-laws be suspended, and that the dues of the society be increased one dollar a year, to be devoted to the research fund. The motion was seconded, and carried unanimously by a rising vote.

Dr. PRICE thanked the society in the name of the National Dental Association.

Dr. Cameron resumed the chair.

Dr. BIDDLE read a recommendation made by Dr. W. B. Mausteller of Harrisburg, at the Pittsburgh meeting in 1916. This recommendation had been laid over to be acted upon at the 1917 meeting. It was as follows:

> RESOLVED, That the recommendation in the report of the Committee on President's Address, making it obligatory for individual members to become members of the National Dental Association, be made in the form of an amendment to the By-laws, to come up for final action at the next annual meeting.

It was moved and seconded that this resolution be adopted. (Motion carried.)

Dr. SEIP then made a motion that the society contribute a total of two thousand dollars toward the building fund of the Research Institute, at such periods and in such amounts as the treasury would warrant.

The motion was seconded by Dr. MILLER, and carried.

Dr. PRICE thanked the society for its action.

The meeting then adjourned until the evening session.

WEDNESDAY—*Evening Session.*

The meeting was called to order by the president, Dr. Cameron, at 8 P.M.

Dr. Cameron called on Dr. WESTON A. PRICE of Cleveland, Ohio, who gave an illustrated lecture on "The Newer View of the Relation of Mouth Infections to Localized and Systemic Disease."

The next item on the program was a lecture by Dr. R. H. RIETHMÜLLER, Montclair, N. J., entitled "Conductive Anesthesia," after which the meeting adjourned until Thursday morning.

THURSDAY—*Morning Session.*

The meeting was called to order by the president, Dr. Cameron, at 9.30 A.M.

Dr. CAMERON. We will now proceed

to the installation of officers. We certainly have had an enjoyable week, and I want to thank you and the members of the different committees for the way in which you have sustained your officers, and for all that you have done.

It gives me a great deal of pleasure to have the honor of presenting to you Dr. C. S. VanHorn as your next president, and I will ask Dr. Stroup and Dr. Walker to conduct him to the chair.

Dr. CAMERON. I was graduated in dentistry in 1900. In 1902 I was appointed on the Exhibit Committee, and was on it constantly for several years. I have served on the Exhibit Committee, the Executive Committee, and the Program Committee, but I never thought of being made president. But the highest honor the society can bestow was given to me. I have enjoyed it, and I thank you. It gives me a great deal of pleasure to turn over the office to you, Dr. VanHorn, because I know that this meeting will not be the largest that we shall have.

It is not necessary to reinstal our very capable officers, the secretary and treasurer. I wish to announce that immediately following this meeting there will be a meeting of the old Council to dispose of the business in hand, and turn over the activities of the State Society to the new Council. Anyone who has any bills or business to come before Council should present them. I thank you all very much.

Dr. VANHORN. Gentlemen, it gives me a great deal of pleasure to accept this high honor which you have bestowed on me. It is a special pleasure from the fact that it comes absolutely unsolicited. I hope I may be able to conduct the affairs of the society in a way that will please you, so far as the presiding officer is concerned.

As there is no other business, the chair will consider a motion to adjourn. (Motion carried.)

The society then adjourned until the next annual meeting.

Dental Society of the State of New York.

Forty-ninth Annual Convention, held at Rochester, N. Y., May 10–12, 1917.

(Continued from page 1150.)

FRIDAY—*Afternoon Session.*

The meeting was called to order by the president, Dr. Murray, at 3 P.M., Friday, May 11th.

The Report of the Committee on Practice, Dr. DANIEL H. SQUIRE, Buffalo, chairman, was read by Dr. Hoffman of Buffalo.

[This report is printed in full at page 1232 of the present issue of the COSMOS.]

A paper by Dr. J. WRIGHT BEACH, Buffalo, entitled "Hygienic Removable Bridgework and Partial Dentures," was read by Dr. Frank W. Low of Buffalo.

[This paper is printed in full at page 1225 of the present issue of the COSMOS.]

DISCUSSION.

Dr. A. E. Sager, Rochester. I have seen two or three cases in the mouth, made by the method Dr. Beach has described, and they seem to be very practical in certain instances, but the cases have to be very carefully selected. I saw a mouth the other day, in which the work was beautifully done; the appliance went into place readily, and held as strongly as a good bridge, or almost as firmly as a fixed bridge. I would not, however, put one of these appliances in the mouth of a patient unless I were absolutely sure that I could see him at least once a month for prophylactic treatment.

I wish to describe the condition in which I found one mouth recently. The patient's wife came to my office and wanted to know if I could suggest some local remedy for her husband. His teeth troubled him so much that he was almost crazy. I suggested some hot applications, and two or three days later the patient reported. There were six upper teeth held in by clasps—I think a molar, bicuspid, and cuspid on each side. There were clasps on each side, and as beautifully made as anything I ever saw, and the appliance was as firm as could be. I asked, "How long has it been since you went to your dentist?" The man replied "One year." I said, "Don't you know better than that? That explains the whole condition. When you were going to your dentist regularly, how often did you go?" He told me, once a month. Every one of the anchorage teeth had tartar on it extending under the gums, and there was gum recession. The man was large and powerful, with large, long teeth. Erosion had taken place on the distal side of the cuspid, but there was not a tooth surface that was not extremely sensitive. He was suffering every minute; it was almost impossible to do anything for him, and it was most difficult for me to give him relief. The only way seemed to be to devitalize each one of those teeth, or extract them all. His appliance was beautiful, and it fitted as firmly as anything you ever saw.

There is where the whole method is going to fail. It is very good in the case of a patient who will follow up the prophylactic treatment. I do not care if this man kept his teeth in the cleanest condition, if he did not have the care of his dentist every little while he could not possibly keep those teeth properly cleaned. They have to be cleaned with the aid of tapes and floss and a lot of things the patient cannot use himself.

I will say this about the round-wire clasp; it is certainly *the* clasp, but the success of the appliance hinges, to my mind, on the dentist taking care of the teeth.

We talk about clearing up infection; but have you read the last article from the Research Institute of the National Association on streptococci? One of these appliances placed in the mouth and not properly cared for is more liable to cause septic infection—because the streptococcus is most constant in the mouth—than anything else you could do.

It is like the story of the man who did not have the heart to cut off the entire tail of the puppy-dog at one time, so he cut it off an inch at a time. If this man could not afford to have a good removable bridge made for his case, the teeth should have been extracted, and a full denture made for him, for now, after only a year, he will have to have one or the other done.

Dr. H. E. S. Chayes, New York. The sum total of what I have to say about this paper—and I am sorry to say it in the absence of Dr. Beach—is that such appliances are wholly unfit for the human mouth. When the Divine Principle designed the human masticatory apparatus, it did not provide for clasps, clamps, and such things; and no matter how finely these things are made, they so change the shape of the teeth after the appliance is in place that neither the tongue, the lips, the cheek, nor the nervous system of the patient can ever, during the time that contrivance is in the mouth, become so used to this apparatus as to be free from its morphologic influence.

Dr. Sager told us about the case that fitted beautifully, and yet he could not touch the teeth. The anchorage teeth were vital when the appliance was first inserted, but it would necessitate a monthly visit to the hygienist or dentist to keep it clean. Anything that would require a monthly visit to the dentist to keep it in condition is self-condemnatory; it is not rational; as a means of maintaining hygienic cleanliness and normal conditions it is absolutely absurd. If that is the best we can do, and with it have to send the people to the dentist to have their mouths cleaned once a month, it is a pitiable sort of restoration, and spells enslavement of the patient.

Dr. Price showed us how we could take out a tooth and scrape the socket and find infection. We need not have a devitalized tooth to have infection; we do not need absolute death to have these organisms present in our bodies, but they are always there, in every animal body that lives on the face of the globe, and until we come to realize that God Almighty never intended bacteria to take hold of a human being who understands the laws of life and lives them normally, we will be in constant fear of these micro-organisms.

Remember that when you make any restoration in the human mouth, you must leave the teeth in exactly the same shape nature gave to them. We must leave them in exactly the same relation to their neighbors as nature placed them. For 500,000 years nature has been trying to teach us how to construct a tooth, and we, with our puny art, put a harness of this kind into the human mouth and attempt to improve on the work God Almighty did.

Dr. White, Syracuse. I would like Dr. Chayes to take the platform again, and tell us how he would handle these cases.

Dr. Chayes. I would be perfectly willing to demonstrate to you if you would come to New York. It would take me some time to show you the method I approve of, and you would get no lucid explanation from the few words I could tell you in this short time; but briefly, I would say there are certain geometric laws for all beings you see in the world—human beings or animals.

The next order of business was the report of the Committee on Scientific Research, which was read by Dr. W. RAY MONTGOMERY.

Dr. Montgomery also read Dr. WM. J. GIES' report for the year 1917.

[This report is printed at page 1238 of the present issue of the DENTAL COSMOS.]

Dr. Frank W. Low, Buffalo. Dr. Beach asked me to say a few words about the Preparedness League, but I doubt if it is necessary. I think the dentists of New York State are thoroughly alive to the importance of this work, and that it will go on successfully to its completion. I was present very recently at the meeting of the trustees of the League and the committee from the National Dental Association, and the reports were entirely satisfactory. There is, of course, a little friction here and there, but it is growing less. There are some dentists who think we should be separated from the Surgeon-general and his medical staff entirely, and have a staff of our own, as they do in Canada; but we believe it will do more to cement the friendship between the medical and dental professions if we can progress as we have been doing. So there will be no effort on the part of the Preparedness League to divorce ourselves from the Surgeon-general and his staff.

The status of the dentists in the army has been improved by recent legislation. A young man who goes into the army as a lieutenant with very much shorter service is likely to become captain, and later major, and in a reasonable length of service he may become lieutenant-colonel; and our men who stay in the service will have greater social position and greater emoluments.

The first examinations for the corps will have to be made by the dentists who are already appointed as dental surgeons. These are nearly all in Texas at present. There is one in New York, and one in California; but as soon as we get the appointment of others from the first examinations, they can in turn become examiners, so that an applicant will not have to go a great distance to take his examination.

MR. IRVING BROWN, a representative of the Dentists' Mutual Protective Alliance, addressed the members of the society on that subject.

The society then adjourned until the evening session.

(To be continued.)

THE DENTAL COSMOS

A MONTHLY RECORD OF DENTAL SCIENCE.
Devoted to the Interests of the Profession.

EDWARD C. KIRK, D.D.S., Sc.D., LL.D., *Editor.*
L. PIERCE ANTHONY, D.D.S., *Associate Editor.*

PUBLISHED BY THE S. S. WHITE DENTAL MFG. CO., PHILADELPHIA, PA.

SUBSCRIPTION PRICE, including postage, $1.00 a year to all parts of the United States, Hawaiian Islands, the Philippines, Guam, Porto Rico, Virgin Islands, Cuba, and Mexico. Canada, $1.40. To other foreign countries, $1.75 a year.

Original contributions, society reports, and other correspondence intended for publication should be addressed to the EDITOR, Lock Box 1615, Philadelphia, Pa.

Subscriptions and communications relating to advertisements should be addressed to the BUSINESS MANAGER of the DENTAL COSMOS, Lock Box 1615, Philadelphia, Pa.

PHILADELPHIA, DECEMBER 1917.

EDITORIAL DEPARTMENT

Standardization — Unification.

IN the July issue we directed attention, among other matters, to the practical importance of a concerted movement toward the standardization of the dental armamentarium, and indeed of the entire outfit, both operative and mechanical, used by the dentist in his work. The suggestion is not new, for it has been advocated by eminent teachers and others for years. As a matter of fact the central *motif* of the work of the late Dr. G. V. Black was his appreciation of the practical utility of standardization as a means for increasing the efficiency of the dental operator and thereby improving the character of his work. The work of Dr. Black in the improvement of amalgam alloys, his study of the physical properties of filling materials in general, in connection with the physical and chemical characteristics of tooth structure, his system of cavity preparation, and his classification of operative instruments both for filling operations and for pyorrhea treatment, all had their origin in the general principle of standardization upon a scientific basis. While much has already been accomplished, particularly in the development of a correct point of view among dental teachers as to the importance of this question, much yet remains to be done before anything like a generally acceptable result in practical standardization can be attained.

The necessities consequent upon our entrance into the activities of the world war have compelled attention to this question of standardization as one pressing for solution. In the application of the principle to the manufacture of machinery, and more particularly of munitions, the utility of standardization is self-evident, for without it the manufacture of munitions and many other industries would be in a state of inextricable chaos. The exigencies of the war have placed dentistry in a new and enlarged field of activity. In times of peace the practice of dentistry in the army was but a minor modification of private practice adapted to army conditions and requirements. The war has wrought not only a sudden and remarkable expansion of army dental service, but as a result of its increased magnitude and its specialized character it has brought forward for solution, and with pressing insistence, the question of standardization of dental supplies as an economic means for the conservation of money and material, as well as the increase of professional efficiency in connection with the activities of the Dental Surgeons Corps.

The demand for dental equipment for the corps in addition to the civilian demand for the same class of products has strained to its utmost the capacity of the dental manufacturing industries of the nation. A very considerable factor contributing to the difficulty of meeting these demands is the multiplicity of instruments designed for the performance of a particular operation—the variations in design representing the personal taste or requirement of individual operators with a limited following who have been induced to adopt these pet methods of procedure. The collective result of the demands for these eccentricities, individually multiplied as they are, is to divert the use of highly specialized skilled labor, which involves a relatively high cost of production and an output in inverse ratio to the cost.

On the other hand, if it were possible for dental teachers to agree upon a standardized method of operating and an armamentarium logically related thereto, so that the profession would not be confronted with a collection of excavators, scalers, pluggers, etc., each designed by an individual teacher and built to perpetuate his name and extend his fame—if the whole group of dental educators would get together and agree upon a set of each class of instruments that all could efficiently use, at least two beneficent results would accrue: First, the economies inherent in quantity production would become operative; and second, a direct benefit to the national service—because under a standardized system of instrumentation a fairly unified system of training would result, and the newly commissioned dental surgeon, no matter in what American dental school he had obtained his professional education, would not encounter, as he now does, difficulties and embarrassment in using the standard outfit of instruments comprising the Government supply table.

Steps toward the standardization of the instrumentarium and the unification of teaching methods in relation thereto have already been taken by the appointment of a sub-committee of the Medical Board of the Council of National Defense charged with that duty. The purposes of the committee have received the official approval and moral support of the deans of American dental colleges. The work, in so far as it relates to the standardization of the dental supplies of the National Government, has for the time being been completed, but the larger and fundamental work in its broad relations to dental education remains to be done. It is a work directly related to the interests of the whole dental profession individually and collectively, and it should not be allowed to languish for any cause, or perish through lack of interest or indifference, as so many of our vital interests have done in the past. We have already accomplished much by concerted action, and a united effort under present conditions will quickly make standardization and unification of method an accomplished fact.

A Correction.

In our November issue we reprinted an article from the *Army and Navy Register* which purported to be an "Extract from the Debate in Congress upon the New Army Dental Act," and in which it was stated that Senators Warren and Overman opposed an amendment to the bill in the Senate. On referring to the official Congressional record of the debate in question we find that Senator Overman did not oppose the bill or the amendment, but, with Senator Pomerene, favored both, and was instrumental in having the amended bill passed over objections from other senators.

We therefore gladly take this opportunity of correcting an unintentional misrepresentation of Senator Overman's attitude toward the dental act referred to, and to further state that he has always championed the cause of dentistry in our national legislative body. We may also add that Senator Warren's objection to the amendment was not to legislation favoring the dental profession, but was offered on the ground that the House would not accept such an amendment, thus endangering the final passage of the bill in the closing hours of the session.—Ed. Cosmos.

BIBLIOGRAPHICAL

A Manual of Anatomy. By Henry E. Radasch, M.Sc., M.D., Assistant Professor of Histology and Embryology in the Jefferson Medical College, Philadelphia. Octavo of 489 pages, with 329 illustrations. Cloth, $3.50 net. Philadelphia and London: W. B. Saunders Co., 1917.

This book claims to be an Anatomy of "intermediate" size, and certainly it is the peer of any within this class. There is far more justification for works of this type than there is for the usual "quiz compend." However, it would be a sad mistake to suppose that they can take the place of the classic productions of Piersol, Gray, Morris, and others. As a rule, the magnitude of a book psychically reflects the magnitude of a subject, and subtly convinces the student of the reality of this magnitude. Only an unusually thorough course in dissection would atone for the brevity and condensation of this book.

Two variations from the usual order followed in anatomical text-books are to be noted. The external anatomy of the nerve system is continued from one segment to another, without interruption, and the histology is discussed in the same manner. The semilunar valves of the aorta and pulmonary artery are described with their respective vessels, in place of being included in the description of the ventricles.

The descriptive anatomy of the oral cavity, and particularly of the teeth, does not go into the detail which the dentist has a right to expect.

A valuable and practical part of the book is the introduction of photographs with outline markings of the viscera, visualizing their relation to surface topography. An enlargement of the illustrations showing the musculature of the face, neck, and extremities would facilitate the student's grasp on this subject.

The manner in which the book is put together and the mechanical form in which it is presented to the public deserves commendation.

J. L. A.

APPLIED ANATOMY AND ORAL SURGERY FOR DENTAL STUDENTS. By ROBERT H. IVY, M.D., D.D.S., Associate Surgeon, Columbia Hospital, Milwaukee; former Assistant Surgeon, Out-patient Department, University of Pennsylvania Hospital; former Instructor in Oral Surgery, University of Pennsylvania. Second Edition, thoroughly revised. A 12mo of 290 pages, illustrated. Philadelphia and London: W. B. Saunders Co., 1917. Cloth, $1.75 net.

The demand for a work on Oral Surgery setting it forth in a concise and attractive manner without unnecessary detail is made evident by the appearance of the second edition, after two reprintings of the first edition, all within the space of six years, of this handbook intended primarily for dental students.

There has long been the need of more clearly defining the field of oral surgery as related to general surgery, and Dr. Ivy, by his long experience in the teaching and practice of this specialty, is peculiarly qualified to perform such a task, which we believe he has accomplished in such a logical manner in the present work that there need be no occasion for the oral surgeon and the general surgeon to encroach upon each other's field of work. The author has very intelligently classified the diseases and injuries to the oral cavity which properly come under the treatment of a specially educated oral surgeon, and which past experience has demonstrated can be more capably handled by him, by reason of his special training, than by the general surgeon.

While this treatment of the subject, as the author says in his preface, is only intended to "point the way," as it were, to the dental student, and attempts simply to present the general subject in a brief manner, we feel that his presentation of some phases of the subject has been almost too brief even for the scope indicated. For example, in his consideration of the phenomena of inflammation he gives five causes of inflammation, but only deals extensively with that phase which is the result of bacterial infection. We fully appreciate the fact that adequate treatment of the subject of inflammation would require a large volume in itself, but we feel that the author's treatment of the subject even in this small volume should have included fuller consideration of the inflammatory reactions arising from other sources of tissue irritation.

It is also regrettable that in the consideration of the subject of general anesthesia the author has not given more attention to the use of nitrous oxid and oxygen in oral surgical operations, because of its acknowledged safety and its universality of usefulness in all classes of patients, as compared with other general anesthetics.

The absence of any reference to root resection in the operations coming under the scope of the dental surgeon's activities is quite noticeable. True, this may be classified as strictly a dental operation, but it is certainly one that the oral surgeon is frequently called upon to perform.

The feature of "review questions" at the end of each chapter is very helpful, and the questions are so framed that the attention of the student is forcibly directed to the prominent points which the author endeavors to impress.

A very complete and full index makes the contents of the book readily accessible for quick reference.

The typography and bookmaking are all that could be desired, and combine to make this a very attractive as well as valuable book for the purposes set forth by the author.

Books Received.

Books received are acknowledged in this column, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

"Essentials of Laboratory Diagnosis." Designed for Students and Practitioners. By Francis Ashley Faught, M.D., Director of the Laboratory of the Department of Clinical Medicine and Assistant to the Professor of Clinical Medicine, Medico-Chirurgical College, etc., Philadelphia, Pa. Containing ten full-page plates—four in colors—and fifty-nine text engravings. Sixth Edition, revised. Philadelphia: F. A. Davis Co. English depot: Stanley Phillips, London, 1917.

"Oral Roentgenology. A Roentgen Study of the Anatomy and Pathology of the Oral Cavity." By Kurt H. Thoma, D.M.D., Lecturer on Oral Histology and Pathology and Member of Research Department, Harvard University Dental School. Instructor in Dental Anatomy, Harvard University Medical School. Captain Massachusetts State Guard Hospital Unit. Oral Surgeon Robert Bent Brigham Hospital. Visiting Oral Surgeon, Long Island Hospital. Member of national, state, and local dental societies and Interstate Association of Anesthetists. Fellow in the American Academy of Dental Science. Associate Fellow of the American Medical Association. With 311 illustrations. Boston, Mass.: Ritter & Co., 1917.

◆

REVIEW OF CURRENT DENTAL LITERATURE

[*Lancet*, London, September 1, 1917.]

Petroleum in the Treatment of Pyorrhea Alveolaris. By H. J. Corin.

The author proceeds on the assumption that pyorrhea is aggravated by if not actually due to causes other than dental—for instance, the absorption of toxins from the small intestine.

For such a condition purified petroleum is used widely and successfully. It is imperative that only the purest oil should be administered.

"In a case where there was only slight discharge of pus from the gums, one course of local treatment, the use of an effective mouthwash, and the patient ordered to take petroleum emulsion, produced a complete cure."

For long-standing cases where there is a copious discharge Corin found petroleum with guaiacol gave wonderful results in clearing up the conditions quickly, and when there is acute gingivitis petroleum with salol is useful.

The central thought of this paper is exactly in line with Black's classical experiment, demonstrating a marked diminution of the deposition of salivary calculus after the administration of a saline laxative.

[*American Journal of Surgery*, New York City, August and September 1917.]

Septic Teeth: Their Etiology and Surgical Treatment. By Josef Novitzky.

Novitzky is an enthusiast. The doctrine that the dental structures are the foci *par excellence* for the localization and dissemination of the agents of systemic infection is accepted in its entirety. Therefore we are to expect his advocacy of radical procedures. "The ionic medication, as advocated by Hartzell, M. L. Rhein of New York, and others, would be a questionable procedure when confined to soft structure. When used to treat a dead, stinking tooth it could be considered only as an effort to retain in the human body that which should be thoroughly removed by radical surgery. . . . The sterility of the contents, however, does not necessarily mean that the [abscess] bag could be considered harmless to the body of the host."

Likewise the use of hypodermic or intravenous injections of drugs and vaccines "should justly be relegated to the scrap-heap." The usual instrumentation, root amputation, etc., are, in all but early or exceptional cases, valueless.

The author gives great weight to the unfortunate anatomical fact that the blood supply to the tooth and surrounding structures is furnished by *terminal* arteries, as a most important conditioning cause of pyorrhea. This view is not original with Novitzsky, but is one which is receiving an ever-increasing recognition.

The larger part of Novitzky's paper is occupied by generalities which are neither particularly new nor interesting to the dental profession. However, this condition is perhaps explicable when we learn that this paper was prepared for a medical and not a dental audience. What is distinctively novel is the following account of his "correct" treatment.

This surgical procedure has been strictly adhered to during over two years in all cases where radiographs and examinations indicate radical tooth removal. "The gums are incised and a liberal flap of mucous membrane and periosteum is stripped off the alveolar process, exposing the entire length of the outer plate covering the roots of the affected tooth. The outer plate of bone is removed, exposing the tooth roots, in order to use them as a guide to pathological conditions at their apices. My operative procedure offers the maximum opportunity for ventilation and drainage, direct access to, and complete removal of tooth and disorganized jawbone." The accidents of extraction are avoided. "Also complications such as antral, inferior dental canal, and anterior naso-palatine canal drainage are plainly apparent." Briefly, Novitzky answers various theoretical objections to this technique.

Thoma ("Oral Abscess"), among others, has advised the thorough curetment of the sockets from which have been drawn chronically infected teeth. This seems to have been about the nearest approach to Novitzky's method. He insists upon a careful radiographic examination of even edentulous jaws, because in such cases he has found infectious foci, remnants of old abscessed teeth long since extracted.

He summarizes his contention in one concluding paragraph. "Dead teeth, when in a pathologic state, should not be extracted, but should be thoroughly dissected out. This procedure is more apt to insure thorough removal of disorganized structure. Dangers of septic retention are reduced to a minimum. Loss of function, through inability to wear a plate, which follows septic retention and long-drawn-out suppuration, is avoided. Rapid healing generally follows. New bone growth invariably takes place, while it is never seen where the parts are allowed to run a long-drawn-out suppurative course."

[*Proceedings of the Royal Society of Medicine, Section of Odontology*, July 1917.]

Comminuted Fracture of the Mandible.
By G. Paton Pollitt.

Cases of Gunshot Injury of the Face and Jaw, with Special Reference to Treatment.
By F. N. Doubleday.

Radiographs of Pollitt's case showed that the patient was suffering from a comminuted fracture of the mandible in the molar region on each side and at the symphysis. Impressions were taken of the lower incisors and premolars and of the upper teeth. Cap splints were prepared. The molars beyond the line of fracture on each side were not included in the splint. This fact is one of interest and importance in view of the successful outcome. Another point of value to note is that practically no teeth were extracted as being included in the fractured area, because they were most of them implicated. There was much new bone formation during the three months that the splints were in place. The articulation is quite good, and with a little grinding of the molars it will be practically normal. The fracture at the symphysis is quite firm. There is no suppuration. In the molar region on the left the solidification is very good also, and there is no suppuration, but there is slight movement on the right side and slight external suppuration.

The cases introduced by Doubleday serve to emphasize some points of general interest. First, the value of radiant heat as a means of making scar tissue supple is illustrated by a case where a dense mass of scar tissue formed in the cheek, prevented the opening of the mouth, and interfered with the treatment. Treatment for three months with Dowsing heat was very successful. The heat was applied for fifteen minutes daily, a 50-candle power lamp being placed about six inches from the patient's face, and the rays, interrupted by the hand of the nurse, being passed to and fro between the lamp and the patient's face. Secondly, satisfactory results followed the extensive extraction of teeth where very extensive comminuted fractures existed. (Pollitt's case shows that such extraction is not invariably indicated.) Thirdly, the cap splint is by far the most satisfactory appliance. In most cases Doubleday uses a double cap splint cemented to the upper and lower teeth with oxyphosphate of copper. To these splints stout hooks are attached, and the jaws immobilized by wiring them together with brass wire. Absolute immobility is thereby secured, and if it is desired to open the mouth to clean it, or to ascertain the progress of the case, it can easily be done by cutting the brass wire, and re-wiring after the examination. Fourthly, the essentials of treatment are drainage by opening up and scraping the sinuses from time to time—"I cannot too strongly deprecate the opening and scraping of the wound and the removal of bone on an extensive scale by the surgeon"—and immobilization of the jaws. In brief, the essentials of treatment are free drainage followed by a period of absolute rest of the parts.

[*La Odontología*, Madrid, August 1917.]

Alopecia Areata and Dental Caries. By FRANCISCO GIRONA.

The most important part of this contribution is a case history. It concerns a man of thirty-nine years who complained of pain in a right maxillary molar, which pain radiated toward the head, cheek, ear, and neck of the same side. Approximately two months previously he had first noticed intermittent pain in the tooth. Within a few days he noted on the right side of his head an area of baldness. Ordinary treatment did not in the least prevent the baldness from extending. Upon examination, there was seen a deeply carious maxillary second molar, and an area of baldness about three by four centimeters on the right parietal region.

The decayed dentin was removed from the tooth, the root-canals found and widened, the pulp extracted, and a proper antiseptic dressing was introduced, protected by temporary gutta-percha stopping. The tooth was left this way for a week. At the expiration of this time the patient presented himself, cured of the alopecia areata, although no other treatment had been employed.

Girona is inclined to explain the cutaneous lesion as a trophoneurosis arising from the irritation of the diseased molar.

[*Journal of the American Medical Association,* July 21, 1917.]

Metastatic Eye Infections from Dental Foci. By JOSEPH M. LEVY, W. F. C. STEINBUGLER, AND M. C. PEASE.

In a series of 57 patients suffering from some form of infective eye disease, a large percentage showed a direct connection between the ocular condition and the dental infection. The authors believe that the eye lesion was not, contrary to the usual opinion, of hematogenous origin, but was due to direct lymphatic spread. In support of this was the fact that the dental lesions were on the same side as the affected eye in a large proportion of cases. The intimacy of these two lesions in a causal sense is manifested by the fact that over half of the cases were cured or benefited in respect to the eye condition by dental treatment, and in all but one of these the dental infection had been on the same side as the affected eye.

[*Journal of the National Dental Association,* October 1917.]

Pathology of War Surgery, with Reference to Its Relation to Diseases of the Mouth. By LEO ELOESSER.

The first disease which the author discusses is tetanus. Of 166 cases about two-thirds occurred after wounds of the lower extremity, a little less than one-third after wounds of the upper, and only 5, that is to say 3 per cent., after wounds of the head. The diagnosis of well-developed tetanus is easy. The main thing is to watch for the early signs, to know that they do occur, and not to pass lightly by a man who complains of stiffness in his jaws or twitching in a group of muscles—not to think that he is "nervous" or has a sore throat, and pay no heed to his complaint.

If the frequency of wounds of the face and jaw in modern warfare be considered, with the subsequent soreness and stiffness of the facial and masticatory muscles, and inflammatory or purely mechanical trismus, then it becomes apparent that there is great danger of passing over this early symptom of tetanus.

Eloesser goes so far as to make the statement that every case is suspicious, and that every wounded man should receive an immunizing injection of tetanus antitoxin as soon as possible.

The next group of diseases considered in this paper are those caused by another group of anaerobic organisms, those causing gas gangrene, malignant edema, etc. The face, head, and jaws are about the only places in the body where these malignant infections do not occur. Eloesser never heard of a gas phlegmon of the neck or of the face and jaws. The face and mouth are probably so well nourished that the tissue necrosis which is needed for the establishment of a gas phlegmon or malignant edema is wanting.

However, these infections are rarely or never unmixed. In such cases the tissues swarm with all kinds of bacteria, harmful and innocent, especially with streptococci and staphylococci. It is in this connection that the condition of the oral cavity becomes of importance.

Streptococcic abscesses are perhaps less frequent about the mouth than brawny streptococcic infiltrates, thick swollen cheeks, periostitides, and phlegmons. They do, however, occur in the floor of the mouth. Streptococcic infections seem less to be feared than the deep staphylococcic infections. Staphylococcic osteomyelitis of the jaw is occasionally met with. Equally dangerous is a staphylococcic parotitis.

Other infections encountered in the military hospitals of Europe are thrush, diphtheritic and croupous infections.

The author's remarks apropos of drainage are interesting: "Drainage is of little value. Make the incision such that you do not have to drain, so that there is nowhere to put a drain, so that there is nothing to drain. Cut away what is dead or rotten or likely to become so, if you can do it without injuring important nerves. The vessels in the head are of less importance; one can tie almost any of them without much damage."

[*Surgery, Gynecology, and Obstetrics*, Chicago, October 1917.]

Complete Bony Ankylosis of the Jaw. By W. P. Carr.

This is a report of three cases cured by operative intervention. Two of the cases had been caused by a fall on the chin in childhood. The third case was the result of middle-ear disease. Complete immobility had existed respectively for five, eighteen, and twenty-two years.

There was absolutely no line of demarcation between the mandible, zygoma, and the base of the skull, and the bone was astonishingly thick and hard. The ramus of the jaw at the point of division was never less than half an inch thick and an inch and a quarter wide, and in one instance was three-quarters of an inch thick by an inch and a half in width, and in some cases was hard as ivory with no cancellous tissue in the central portion.

The technique of the operation was essentially that of Murphy. However, it is not really necessary to interpose fat or fascia between the divided bone surfaces, provided they are well separated and a rather pointed articular end cut on the ramus. Carr advises that the transverse portion of the cutaneous incision be at the level of the lower border of the zygoma. He prefers hand chisels and instruments—never resorting to the hammer—to motor-driven drills or saws for cutting the bone.

In one case the internal maxillary artery was cut. Accidentally the parotid gland was cut in each of the three cases. Carr's greatest difficulty, however, was in overcoming the contraction of the masseter and internal pterygoid muscles, which was gradually remedied by the use of lead expansion screws and small dental jackscrews placed between the molars.

In each of the cases function was very satisfactorily restored.

[*Parasitology,* Cambridge, Eng.]

Observations on Entamœba Gingivalis, with a Note on the Trichomonad Flagellate Tetratrichomonas Buccalis (n. sp.).

BY T. GOODEY AND A. W. WELLINGS.

This is not only an important contribution to a very prolific subject, but the manner and form also in which the results are presented to the public could not be improved upon.

The authors were first led to this study by Barrett and Smith's report in the August COSMOS of 1914. The results of this study are here set forth. Two principal lines of attack on the problem were adopted; first, a careful investigation into the structure of the amœba by exact cytological methods, particular attention being directed to the nature of the inclusions, and second, an examination of a number of mouths, some healthy, others showing a variety of pathological conditions.

The living amœbæ were successfully observed with the warm stage, using the hanging-drop method. By the use of Minchin's salt-citrate solution plus 15 per cent. white of egg, it is possible to get very good film preparations on fixation, for the egg-albumin in coagulating adheres to the cover-slip, and holds most of the bodies present in the film.

As fixatives, Maier's solution, Bouin's fluid, and absolute alcohol were used. The last is especially useful for rapid work when methyl-green is used as a subsequent stain. Iron-hematoxylin was found to be the most useful stain for revealing the detailed structure of the organisms, and most of the films used in this study are stained with this. Dobell's iron-hematoxylin was generally employed. Other stains used were Jenner's blood stain, Giemsa's stain, Unna's polychrome methylene blue, safranin and lichtgruen, Mann's methyl-blue eosin, and methyl-green. This last stain was only used to investigate the nature of the round inclusions within the amœbæ.

Their observations on the morphology of the living as well as of the stained preparations in general agree very well with those of Craig (*Journal of Infectious Dieases,* Chicago, 1916, xviii, 220). They never observed the intake of a polymorphonuclear leucocyte, nor was there found in their stained preparations anything suggestive of a whole ingested polymorphonuclear leucocyte within an amœba. When stained none of the amœbæ showed anything which could be interpreted as mitotic division figures. Goodey and Wellings were unsuccessful in finding either the cystic or the precystic stage described and figured by Craig.

The importance of determining the nature of the food of E. gingivalis lies in its relevancy to the question of the possible pathogenicity of the organism. With iron-hematoxylin, the majority of the food bodies, vacuoles, ingesta in the amœbæ, stain an intense black, while others exhibit various degrees of blackness, and some are faintly stained. The black coloration with iron-hematoxylin suggests that these food bodies are composed of a chromatinic substance, a fact which is confirmed by the use of other stains. The various stains, of microchemical value, show that the bodies are rich in chromatin, and that they are probably derived from nuclear material. These stains also definitely rule erythrocytes out of the question.

Careful examination of the films carrying amœbæ showed that, scattered about among the innumerable bacteria and leucocytes, there were here and there small bodies having exactly the same shape, size, and general appearance as the ingesta of the amœbæ. It was clear that if the nature and origin of these bodies could be satisfactorily explained, it would be possible to clear up the question of the ingesta of the amœbæ. Comparative observation made it apparent that the bodies in question were produced from the nucleus or nuclei of degenerated and disrupted salivary corpuscles.

The second part of the work is devoted to a detailed microscopic study from the mouths of twenty-four individuals exhibiting the most varied oral conditions.

The conclusions of the authors are succinctly summarized as follows: E. gingivalis, far from being a destroyer of healthy tissues of the mouth, is in reality a devourer of waste nuclear material derived from disintegrated salivary corpuscles, together with bacteria, and is therefore probably a useful scavenger. The second part of their study led to the conclusion that the amœba may be found in healthy and unhealthy mouths, and is especially likely to be found in situations where there is the possibility of the accumulation of food débris.

"Our general conclusion is that there is no evidence to show that E. gingivalis is the cause of disease."

T. GOODEY'S NOTE ON THE TRICHOMONAD.

This organism, so generally identified with Trichomonas vaginalis (synonyms T. hominis and T. intestinalis) has already (see COSMOS, May 1917, p. 561) been not only as carefully defined as Goodey here defines it, but also cultivated, by Ohira and Noguchi. These latter workers assigned to this protozoan parasite the name of Tetratrichomonas hominis. Consequently, while Goodey's generic name agrees with this, his specific name must yield in priority to that of Ohira and Noguchi. In the future it appears preferable to recognize this organism as Tetratrichomonas hominis.

[*Presse Médicale*, Paris, August 23, 1917.]

Connection Between Alopecia Areata and Defectively Developed Teeth. BY R. SABOURAUD.

Sabouraud presents illustrations of the teeth of persons with alopecia areata. They indicate to his mind that some initial teratological disturbance is responsible for the tendency for the hair to fall out, and for the defective teeth and the defective growth of teeth and nails. Inherited syphilis is sometimes but not always responsible.

[*Journal of Cutaneous Diseases*, Chicago, August 1917.]

Perlèche. BY JOHN E. LANE.

This is a disease which is only poorly known in America, and relatively of but scant importance. Lane carefully summarizes the literature, appends a bibliography of forty references in addition to text-books, and presents us with a well-proportioned and complete picture of the condition.

Perlèche affects the labial commissures, usually is bilateral, and generally rather closely limited to the commissures. As the disease progresses the process extends for a varying distance toward the center of the lips, and usually extends on to the true mucosa of the inner side of the lips. The epithelium is at first whitish, with a slight mother-of-pearl tinge. Later the epithelium becomes macerated, and sometimes can be easily detached. Ordinarily the superficial layers of the epidermis are the only ones affected, and the surface is not denuded. Frequently there are little cracks or fissures running in the direction of the commissural folds. These little fissures radiate, and when the child opens his mouth there is slight pain, and occasionally slight hemorrhage from them, though usually they are distinguished by the fact that they do not bleed readily. Usually there is no inflammatory reaction around the lesions. There is very rarely any considerable hypertrophy of the tissues affected. After the lesion is healed there is for several months a smooth, white, nacreous surface, which permits the recognition of children who have recently been affected.

Generally prompt cure follows the painting of the lesions with a mild antiseptic, *e.g.* 10 per cent. silver nitrate; a dilute tincture of iodin; the copper sulfate or alum pencil every day or every other day. Antiseptic mouthwashes have also been recommended. For the more resistant cases, a 5 per cent. solution of chromic acid is used.

Little is known of the geographical distribution of this disease. Most of the literature is European. The present article contributes the fact that the disease is common in New Haven, Conn.

Perlèche is pre-eminently a disease of infancy and childhood. Both sexes are equally affected. All observers agree that the disease is highly contagious; probably it is a streptococcic infection.

[*Journal of the Royal Microscopical Society*, London, 1917.]

On Certain Parasites of the Mouth in Cases of Pyorrhea: Preliminary Communication. BY HELEN P. GOODRICH AND M. MOSELY.

The whole article shows great unfamiliarity with dental matters, and it is hard to find in it anything original. The authors' summary tells the whole story—"Pyorrhea lesions differ from other suppurating sores in that no organisms appear to invade the tissues. . . . We cannot yet definitely accuse any organism of being the primary cause of the gingivitis with which we feel sure the disease begins, but are inclined to incriminate the leptothrix."

Goodrich and Mosely propose to cultivate complete colonies of this organism, and thereby adduce conclusions that the fusiform, coccoid, and filamentous forms are all parts of the same organism.

PERISCOPE

Periodontia Nomenclature.

(Report of Committee on Nomenclature and Scientific Investigation, American Academy of Oral Prophylaxis and Periodontology.)

Oral hygiene: That branch of hygiene dealing with the mouth.

Oral prophylaxis: A term applied to any procedure designed to prevent diseased conditions of the teeth and periodontal tissues, and to protect and preserve the general health. Such procedure may be instructional, orthodontic, surgical, mechanical, or medicinal.

Oral prophylactic treatment: A systematized periodic treatment designed to maintain the health of the teeth and periodontal tissues.

Periodontoclasia: The process of destruction of the tissues immediately surrounding the teeth.

Periodontology: The study of periodontoclasia.

Periodontal or *periodontic:* Of or pertaining to the tissues immediately surrounding the teeth.

Periodontia: That branch of dentistry devoted to treating abnormal conditions of periodontal tissues.

Periodontist: A dentist who practices periodontia as a specialty.

CLASSIFICATION OF PERIODONTAL DISEASES.

Recession: Atrophy of the gum margin and underlying tissues, resulting in exposure of the cementum.

Gingivitis: Inflammation of the gum margin.

Acute ulcerative gingivitis: Acute gingivitis, producing rapid superficial ulceration of the gum margin.

Suppurative periodontoclasia: Separation of the principal tissues from the cementum with macroscopic formation of pus.

Non-suppurative periodontoclasia: Separation of the periodontal tissues from the cementum without the macroscopic formation of pus.

Alveolar periodontoclasia: Resorption of the alveolar process without separation from the cementum, and without macroscopic pus formation.

Periodontal abscess: A periodontal abscess not primarily involving the periapical tissues.

BASIC TYPES OF PERIODONTOCLASIA.

1. *Recession:* Atrophy of the gum margin and underlying tissues, resulting in exposure of the cementum. 1*a*. *Traumatic recession:* Recession induced by mechanical abrasion; usually limited to labial and buccal gingivæ. 1*b*. *Pathological recession:* Recession of gums more or less uniformly around affected teeth, due to resorption of the alveolar process. Gums are somewhat swollen and of abnormal redness.

2. *Gingivitis:* Inflammation of the gum margin. 2*a*. *Chronic gingivitis:* A low-grade chronic inflammation. 2*b*. *Acute gingivitis* (Vincent's gingivitis): Acute inflammation, inducing rapid superficial ulceration of the gum margin.—*Dental Items of Interest.*

Feather-Edges on Gold Inlays.—To avoid "feather-edges" on cast gold inlays at the gingival border, insert the sprue in the wax pattern on the occlusal surface—never on the contact point or approximal surface.—VICTOR H. FUQUA, *Dental Review.*

Post-extraction Pain.—Post-extraction pain, as well as profuse bleeding, can be helped in a large number of cases, and usually stopped entirely, by prescribing a mouthwash of cold water containing sufficient sodium chlorid to make it taste quite salty.—*Pacific Dental Gazette.*

Banding Broken-down Teeth.—In performing a root-canal operation on a badly broken-down molar or bicuspid, select an aluminum band such as those made by the Blue Island Co. Have the band slightly larger than the tooth circumference, dry the tooth surface thoroughly, slip the trimmed band to place, and pack base-plate gutta-percha between tooth and band. These bands will at times stand the pressure of a rubber dam clamp, but in the majority of cases the clamp is placed on the tooth distal to the one we are operating on.—ELMER S. BEST, *Dental Review.*

Wax Models for Dummies.—After carving to form, the wax should be trimmed free of contacts with abutments. This greatly facilitates the adjustment of finished casts to the model, and allows the space necessary for soldering.—N. R. SMELTZER, *Dental Review.*

To Lessen Pain.—After an extraction, where bone has been removed by burs or chisels, or where alveolar process is exposed, dry the surface and apply 95 per cent. phenol, then neutralize with alcohol. This will lessen the post-operative pain.—R. E. LIGHT, *Dental Review.*

Acetozone.—This substance, another of the series of "ideal antiseptics," is stated to have great advantages over our old and tried friend hydrogen dioxid, which, as most of us know, is unstable and momentary in its oxidizing power. Acetozone, chemically described as "benzoyl-acetyl-peroxid," and used in aqueous solution, is said to be stable, non-irritating, to have no inhibitive effect on phagocytosis, also to be very rapid in action and effective in septic wounds that have resisted all other forms of treatment.—*British Dental Journal.*

A Hint on Partial Lower Dentures.—Partial lower dentures supplying some or all of the bicuspids and molars, sooner or later, on account of the absorption of the alveolar process, settle to such an extent that the teeth of the denture do not reach up to and occlude with the teeth of the upper set.

Any attachments used for retaining the lower partial denture should be so constructed that they will adapt themselves to such changes as are caused by the absorption of the alveolar process.

The following method for raising the lower partial denture so that the teeth of the denture will properly occlude with the upper set will be found to be practical, and easy of accomplishment:

Drill numerous holes into those parts of the denture that rest upon the gum, and place one or more sheets of wax over those surfaces, according to the amount of absorption that has taken place. Then warm the wax in hot water to soften it, place it in the mouth, and allow the patient to bite, bringing the teeth of the denture into proper occlusion with the upper set. Cool the wax while in the mouth, remove and trim off the surplus wax, then flask the case upside down and vulcanize rubber in place of the wax, which will restore the denture to its original position in the mouth.—H. A. CROSS, *Dental Review.*

Saturated Solution of Salt as a Dentifrice.—I have been experimenting with a saturated solution of salt water, and also with pure salt used with the toothbrush for brushing the teeth and gums, and am greatly surprised at the wonderful results obtained.

My attention was called to this treatment about a year ago by several of my patients whose mouths were in the pink of condition. On inquiry, I found that they used salt water or in some cases pure salt with the toothbrush, doing the work thoroughly. Since then, after scaling the teeth and suggesting the usual hygiene of the mouth, I advise all of my patients to use a saturated solution of salt water or to dip the moistened brush in fine salt and brush the teeth and gums—up and down—twice daily, and am gratified by the splendid results. It will tone up and harden the gums, keep the teeth free from deposits to a great extent, and will do more to cure pyorrhea than the usual treatment given. In cases of chronic pyorrhea, I give the emetin treatment, internally, in conjunction with the use of the salt water or pure salt. While emetin seems to be of great benefit, at least temporarily, the use of the salt treatment will prevent the recurrence of the disease.—MARTIN WILLIAMS, *Journ. N. D. A.*

Porcelain Jacket Crowns.—This clinic on porcelain jacket crowns was given to show the wide field in which they may be used to advantage. When properly made they are ideal from the esthetic as well as the prophylactic standpoint.

The jacket is the ideal crown for several reasons. It is not necessary to devitalize the pulp except in cases of exposure at the commencement of the operation. It is the most natural-looking crown, and possesses the greatest degree of translucence; also detail individualities may be reproduced to correspond with the natural teeth.

Jacket crowns are indicated in the following cases: Peg laterals, malformed or discolored teeth; when a tooth is over one-third broken down; badly eroded teeth; deciduous teeth that remain in the adult mouth—radiograph the case and ascertain that there is no unerupted tooth under the deciduous tooth. Jackets may also be used to advantage when opening the bite. All-gold crowns that irritate the gums should be replaced by jacket crowns; teeth that are rotated may be corrected by jacketing. Root crowns that are ill-fitting may be split off, leaving the post in the root-canal; cut a shoulder on the root and make a jacket crown for the case.—HUGH AVERY, *Dental Items of Interest.*

"Rickets" and Eruption of the Deciduous Teeth.—Rickets is certainly an important cause in delaying the eruption of the deciduous teeth, in 76 per cent. of the cases of rickets, according to Dr. Still, the first tooth being delayed, occasionally even to the eighteenth month. Rickets also induces an unstable condition of the nervous system, which renders teething a source of danger to the infant, so that such children are very liable to convulsions during dentition.

As to causation, the generally accepted view is that rickets is due to excess of starch in the food, or deficiency of fat, but especially if both causes are combined, as is often the case in patent foods, so that an infant may develop the disease even if no starch be given, if the milk is too dilute and hence contains too little fat.—T. WILSON SMITH, *British Dental Journal.*

Vincent's Angina.—We learn from Captain E. Embrys-Roberts, writing in a medical contemporary, that many cases occur among the troops at the front of gingival and throat disease in which the typical fusiform bacilli and spirochætes of Vincent's angina are demonstrable. The treatment which he has found most useful is a local application consisting of hydrogen dioxid, ℥v; ipecacuanha wine, ʒiij; glycerin, ʒv, in 8 ounces of water. The throat condition, he says, clears up in two days, while the gums recover in less than a week. He suggests that the rationale of this line of treatment is the cleansing of pus by the dioxid, which prevents the growth of the anaerobic bacilli, while the ipecacuanha acts specifically upon the spirochætes, the glycerin being valuable from its hygroscopic properties. The use of ipecacuanha in such cases is not of course new to us, but this report seems to indicate its very real value as a local application.—*British Journal of Dental Science.*

Tooth Staining.—It often becomes necessary, in order to get an artistic and natural effect in unusual-colored teeth, where a crown, bridge, or partial plate is required, and it is impossible to make the proper selection from the teeth in stock, that the staining or painting of the teeth be resorted to. In order to accomplish this to defy detection the crown or tooth must first be recut and fitted to its abutment, all the glazed surface removed with a coarse disk and finished to a semipolished surface with cuttlefish, and finally polished by means of pumice and whiting: this permits the surface to accept the colors, which are put on with a fine artist's brush and then diffused over the surface with the finger. The paints used are "Lacroix" French china paints, softened with lavender oil. The colors necessary for most cases are black, brown, yellow brown, ivory yellow, ivory white, celestial blue, and rose pink.

After the required results are obtained the tooth is placed in the oven and baked to 1700° Fahr., when it can be removed. Most beautiful bonelike effects are the result, with very little labor and time expended by the operator.—J. S. RUYL, *Dental Items of Interest.*

The Dental Habits of the Central African Races.—Primitive man in Central Africa pays more attention to his teeth than to any other part of his body. We have in our travels seen men with not enough clothing to make a decent pocket-handkerchief, but they had their toothbrushes; we have seen thousands of women with no clothing whatever, but strung around their necks or behind the ears as we carry a pencil, or stuck in their hair, you would see their toothbrush. We have been on trek in almost waterless districts, and seen the little water obtainable for toilet purposes, sometimes not more than a mouthful, but it is invariably used as a mouthwash and toothwash.

There is a custom running through nearly all Central African tribes of filing their front teeth. This is begun at an early age, and carried on—if the person can stand it—until the desired end be obtained. The practice extends to both men and women, but not to the same extent among the women. A native-made file is used to cut the teeth roughly into shape, and then the finishing touches are made by scraping with a sharp knife.—Rev. JOHN HOWELL, *British Dental Journal.*

Truss-type Lingual Bar Lower Denture.—Instead of the usual heavy round or oval lingual bar or swaged plate there is made a truss consisting of an upper and lower span of stiffened iridio-platinum or platinum-gold wire, connected by vertical bars or rods with solder, placed in position most convenient to obtain the desired result.

The theory of a truss span as used in bridges is the basis of this idea.

The lower span wire may be sixteen- or eighteen-gage wire, round, and the upper may be the same gage or thinner, as the case indicates. The lower span is shaped and fitted first, and soldered to the lower border of the saddles. The upper is then shaped and fitted and soldered to the upper surfaces of the ridge of the saddles. The vertical rods are then fitted and soldered. There may be as few or as many as the length of the span will require, and so placed as to best fit the conditions of the lingual aspect of the remaining anterior teeth. Wire loop clasps are used with this denture.

The points of superiority of the truss-type lingual bar are adaptability, strength, rigidity, lightness, cleanliness, beauty, and symmetry.—H. J. SAMUELS, *Dental Items of Interest.*

Granuloma.—A great deal of confusion has arisen through the adoption of the term "granuloma." A granuloma is the result of a regenerative process having taken place in an abscess cavity, the bone cavity being filled with a soft mass, and one that usually still contains infectious matter. These granulomata may partially heal and still be filled with infectious matter, requiring only slight irritation to cause them to again spring into full activity. The mere appearance of a shadow about a root-end may mean many other things than an infection. During the course of treatment of pulpless teeth it often becomes necessary to employ drugs acting as strong escharotics, and the result may be a coagulation of lymphoid matter at the root-end, which may appear as a darkened shadow area at the apex in a picture. Such a condition, naturally, would in nowise indicate a pathological condition. It requires a good deal of special skill and practice to read these X-ray pictures with any degree of intelligence. To determine whether the picture denotes an active inflammatory process, an old abscessed condition undergoing the process of repair, or one that has already healed is not such a simple matter, and it is therefore entirely wrong to condemn to the forceps all teeth which by casual X-ray examination denote some change from the normal. It is equally wrong to make light of actual pathological conditions which may be seriously undermining the patient's general health. No doubt these active pathological conditions have considerable influence as oral foci of infection.—H. H. SCHUHMANN, *Dental Review.*

Trismus.—At the Val de Grâce, Kouindjy treats trismus patients by re-education without the use of any apparatus.

He differentiates between the four following types of trismus: (1) Articular and periarticular. (2) Cicatricial or sclerotic. (3) Contraction due to the presence of a foreign body. (4) Contractions not included in the above (nervous contractions).

The cause of the trismus being determined, it is eliminated, as far as possible, by massage for the first and second classes, and sometimes by operation to get rid of an adhesion or free a cicatrix—but this treatment risks the creation of new adhesions, and so it is seldom used; by removal of the foreign body in the third class, and by persuasion whenever possible for the nervous cases. At the same time the patients have to practice opening and closing the jaw, and also moving it laterally at the word of command; assistance may be given with the hand, but too much pressure should not be used. These exercises last two or three minutes each day, although in the intervals the patient may try to make these movements himself, but no appliances are worn.

I have seen patients cured in a month; at first they open the mouth to the extent of 7 to 8 mm., and each day progress was noticed, until at the end of four weeks the patient could open normally, say, 30 to 35 mm.

Patients of the fourth class are the most difficult to treat. Kouindjy has called them "spasmodic re-educationals," because they have learned the habit of only opening the mouth to a limited degree. They have educated their muscles to contract when they reach a certain point, and nothing can make them open their mouths more. The cause must be sought in the wish not to be cured for fear of being sent back to the front. One characteristic of this type of trismus is the extraordinary irregularity of the opening of the mouth, one day as much as 10 or 15 mm. and the next day falling back to 7 or 8 mm. Sometimes in the course of a few minutes one may notice differences as great as 8 or 10 mm.—E. COMTE, *Dental Record.*

The M.O.D. Inlay Simplified.—Take, for instance, an upper second bicuspid with an M.O.D. cavity closely situated between the molar and first bicuspid. Pack in some gutta-percha on the distal side to get some separation, or if there is strong tooth structure at the gingival part of that tooth use a mechanical separator. Prepare a disto-occlusal cavity, ignoring the mesial part altogether. Extend the occlusal part to the mesial and widen out the end past it in cone-shape form. Carve the wax to make it a disto-occlusal inlay. Into the occlusal part of the wax with a sharp lancet cut out through the entire thickness a canal or slot, running from the mesial end and terminating in a cone-shape or clover-leaf shape or T-shape at the distal end, so that the wax pattern is really a disto-occlusal inlay, with the occlusal part the form of a fork, one arm of it adapted to lingual, the other to the buccal wall of the tooth. Remove this wax inlay, and cast. After the inlay is fitted and finished, fill in that central slot with wax or gutta-percha and cement it into place. Now proceed with the other side of the tooth. Get separation in any of the ways mentioned, and remove the wax or gutta-percha from the slot of the inlay in place. Carve the wax into the mesial cavity, extending it into the canal or slot of the inlay previously provisioned. Remove the wax, cast, and cement into place. This inlay will have its retention in that cone-shaped or T-shaped provision made in the first inlay, and both will form a well-fitting, interlocked M.O.D. inlay.

This is also one of the operations that takes more time to explain than to do. The advantage of making it so is obvious. It simplifies the work, which can be done with less nervous strain and more sureness of good fit than to make the M.O.D. inlay in one form. And this surely overbalances the extra work of investing and casting each half separately. For the one who invests half a dozen or more inlays at a time, this extra work is of very little consideration.—S. SIEGEL, *Dental Outlook.*

To Make a Strong Vulcanite Denture.—(1) *Flasking and packing.* Use a good grade of plaster. Do not use oil as a separating medium in flasking, as oil has a deleterious effect on rubber during the vulcanizing process. Separate the flask after immersing in hot water, as wax melted (as may happen in a flask heated over gas) is absorbed by the dried plaster, which is thereby deteriorated.

Remove wax with boiling water to which a lump of washing soda has been added.

After boiling out the wax, thoroughly clean every tooth, especially the pins and the holes of diatoric teeth, otherwise the attachment of the vulcanite will not be secure. This can be done with a small pledget of cotton held in tweezers, or if cotton is saturated with boiling water and soda, it answers the purpose admirably.

The rubber should be packed with perfectly clean fingers and points. Care should be taken that no fragments of plaster get into the rubber. It is a good plan to cut away, before boiling out the wax, any feather-edges of plaster, such as may occur at the back of the palate or about the teeth, when for any reason the teeth have been covered up in investing, as is sometimes done with partial plates.

Be very careful not to overheat the flask before packing. In packing consolidate the rubber about the teeth and try with linen.

Use a minimum of pink rubber, and always completely line the palatal aspect with base rubber, and wherever possible bring the base rubber just over the edge of the gum. If desired, gutters can be cut in the plaster to carry off the excess of rubber.

(2) *Vulcanizing.* Have only half an inch of water in the vulcanizer, and always raise the flasks above the water. The manufacturers of rubber advise one hour and fifteen minutes at 315° F. This certainly vulcanizes, but by no means gives the best results.

Infinitely better results are obtained by allowing half an hour to raise the temperature to 290° F., holding that for one and a half hours, then raising the temperature to 310° F., and holding that for half an hour. Never blow off the steam, but allow the vulcanizer to cool down until it can be opened, and then allow the flasks to become cold before separating them. It is probably better to leave the flasks in the machine all night, but that, unfortunately, is not always practicable. It is absolutely essential that the flasks be cooled gradually to secure the best results.

The writer has vulcanized a narrow bar of rubber two inches long, under what he terms trade conditions, and also under his own, and proved his own method to be better.

(3) *Tinfoil.* The use of tinfoil undoubtedly gives a denture a denser surface. A plate so treated is more impervious to the fluids of the mouth. Under tinfoil the vulcanite appears to hug the teeth more closely. Use two suitable strips of foil for the gums, and similarly for the lingual aspect of the lowers, and for the palate half a circle. To assist adaptation, cut a slit about half an inch long into the palate from center of the back line so that the edges will overlap. Allow the foil to come well up the teeth, and adapt it nicely about the necks of the teeth with a wax spatula, warmed if necessary.

To summarize: Employ perfect cleanliness throughout, vulcanize slowly and cool gradually, use tinfoil, and results will be good with most any grade rubber.—K. C. MORPETH, *New Zealand Dental Journal.*

HINTS, QUERIES, AND COMMENTS

Dry Heat in Packing Vulcolox Teeth.

TO THE EDITOR OF THE DENTAL COSMOS:

Sir,—I hear the complaint in regard to Vulcolox teeth that often the rubber will not completely fill the anchorage portion.

There is absolutely no danger of such difficulty if *dry heat* be used in packing. After the wax has been removed and the case allowed to dry a little, a pledget of bibulous paper—not cotton—should be held by tweezers and all moisture sopped away. Then, if the case is heated with dry heat, expelling all the moisture, packing can be proceeded with the same as with pin teeth, without the packing of small pieces into the undercuts of the teeth.

Also in packing the "diatoric" teeth, if in waxing up the case, wax is flowed between the teeth and the traverse holes are blocked with the wax, no attention need be paid to placing rubber in each tooth.

If the dentist will use *dry heat only* throughout the process of packing and closing, *no trouble will occur.*

It is surprising how a little moisture will remain in the bottom of the anchorage unless the above precautions are taken, and the smallest amount of moisture left in the anchorage will vaporize and prevent proper anchoring of the rubber.

The great point is absolute dryness, and this can be attained, in my opinion, only with dry heat.

Yours truly,

J. H. BEEBEE.

Rochester, N. Y.

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OBITUARY

Dr. William A. White.

DIED, Sunday, October 14, 1917, at his home, Phelps, N. Y., in his sixtieth year, after an illness of several months, WILLIAM A. WHITE, D.D.S.

Dr. White was born in Albany, N. Y., September 14, 1857. He was graduated from the Baltimore Dental College in 1881, and since then had practiced his profession in Phelps.

Dr. White always took an active interest in matters pertaining to the welfare of his home town as well as to his profession. During his career he had held the office of president of the Seventh District Dental Society and of the New York State Dental Society, and at the time of his death was a member of the State Board of Dental Examiners.

For three years he was associated with the New York State Department of Health as consultant and lecturer, during which time he lectured extensively throughout the state before schools and various organizations on oral hygiene.

Dr. White also served five years as a member of the board of education of the Phelps High School, was a member of the Presbyterian Church, treasurer of the Sunday School for a quarter of a century, and a member of Sincerity Lodge, F. and A. M. 200.

In April 1883 he married Miss Fannie Frazier, who with two children, Mrs. George B. Nelson of Chicago and Harry White of San Diego, Cal., survives him.

The funeral was held at 2.30 o'clock on Friday afternoon, October 19th, from the family home, Phelps, N. Y.

Dr. Prince Wing Weed.

Died, Thursday, October 25, 1917, at his home in Saratoga Springs, N. Y., from old age, Dr. Prince Wing Weed.

Dr. Weed was born in the town of Greenfield, N. Y., December 22, 1833, the son of Seneca and Catharine (Drake) Weed. Had he lived until his next birthday he would have been eighty-four years old. He was the last survivor of a family of five sons and five daughters.

Dr. Weed began the study of dentistry when he was twenty years of age, first with Dr. Charles E. Carpenter and later with Dr. Charles H. Payne, dentists of Saratoga Springs whose names will be recalled by older residents as once well known in that place. Beginning the practice of his profession for himself, he opened his first office in the old Whiting building, now the Hewitt building, on the west side of Broadway in 1859.

Dr. Weed's life was a remarkably active one. For a period of sixty-one years he had practiced dentistry, and, indeed, did not retire from active work in his profession until about a year ago. Until the very last he retained a deep interest in public affairs, and read and discussed eagerly all that concerned the city and nation. In politics he was a republican.

He was a charter member of the Fourth District Dental Society, and a charter member of the New York State Dental Society, and a life member of both. He was a life member of the National Dental Association. He had been a member of the First Baptist church for sixty years and at one time was a trustee of that body.

Dr. Weed was married May 24, 1860, to Miss Emma Ford. Besides his widow his survivors are two children, Dr. Ernest F. Weed of New York City and Miss Sarah K. Weed of this city; one grandchild, Mrs. Athan Hazapis of New York City; one great-grandchild, Thomas A. Hazapis of New York City, and several nephews and nieces.

Funeral services were held at his late residence, and interment took place in the family plot in Greenridge cemetery.

Dr. Benjamin Percival.

Died, Wednesday, September 19, 1917, at his home, Lynn, Mass., from diabetes, in his sixty-ninth year, Dr. Benjamin Percival.

Dr. Percival was born in Philadelphia in April 1848, and came to Lynn with his parents when eight years of age. After his common school education, he decided to adopt the profession of his father. He was graduated in Philadelphia in 1869 and opened an office in Lynn, which he maintained for many years, having the best families of that town as his patrons.

During his professional life Dr. Percival found many leisure moments in which to indulge his love for nature and the development of his talents as poetic and painting story-teller of what he found by close and intelligent study. His fine and artistic nature drew to him a circle of friends of similar artistic and intellectual tastes, and he early affiliated himself with all the societies of art or historic nature in his section.

Among the societies in which he was active and to which he lent the value of his intellectual accomplishments were the Lynn Historical, the Houghton Horticultural, Boston Natural History, Boston Scientific, Boston Mycological, also the Boston Chess Association and the Essex Institute. He was the first president of the Lynn Dental Society, with which he has maintained his membership, though retired from active business for several years.

Dr. Percival was connected with the Society of Friends of the Silsbee st. meeting, where his advice and counsel were much valued.

He is survived by his wife, Mrs. Mary P. Percival, and a son, Dr. Benjamin W. Percival, dentist.

ARMY AND NAVY DENTAL NEWS

THE NAVY DENTAL CORPS.

[*See footnote on next page concerning* NAVY DENTAL RESERVE CORPS.]

Circular issued by the Surgeon-general, U. S. Navy.

FOR THE INFORMATION OF PERSONS DESIRING TO ENTER THE DENTAL CORPS OF THE UNITED STATES NAVY.

A CANDIDATE for appointment to the Dental Corps of the Navy as dental surgeon must be a citizen of the United States, between twenty-four and thirty years of age, a graduate of a standard medical or dental college, trained in the several branches of dentistry, of good moral character, and of unquestionable professional repute.

The act of August 29, 1916, provides in part as follows:

"That the President of the United States is hereby authorized to appoint and commission, by and with the advice and consent of the Senate, dental surgeons in the Navy at the rate of one for each one thousand of the authorized enlisted strength of the Navy and Marine Corps, who shall constitute the Naval Dental Corps, and shall be a part of the Medical Department of the Navy. Original appointments to the Naval Dental Corps shall be probationary for a period of two years, and may be revoked at any time during the probationary period by the President: *Provided*, That the rank of such officers of the same date of appointment among themselves at the end of said probationary period shall be determined by the recommendations of an examining board appointed by the Secretary of the Navy, which board shall conduct a competitive examination, based upon both service record and professional attainments, in accordance with such regulations as may be prescribed by the Secretary of the Navy; and the rank of such officers so determined shall be as of date of original appointment with reference to other appointments to the naval service: *Provided further*, That all appointees to the grade of dental surgeon shall be citizens of the United States between twenty-four and thirty years of age, and shall be graduates of standard medical or dental colleges and trained in the several branches of dentistry, and who shall, before appointment, have successfully passed moral, physical, and professional examinations before medical and professional examining boards appointed by the Secretary of the Navy, and have been recommended for appointment by such boards.

"Dental surgeons shall have the rank, pay, and allowances of lieutenants (junior grade) until they shall have completed five years' service. Dental surgeons of more than five but less than twenty years' service shall, subject to such examinations as the Secretary of the Navy may prescribe, have the rank, pay, and allowances of lieutenant. Dental surgeons of more than twenty years' service shall, subject to such examinations as the Secretary of the Navy may prescribe, have the rank, pay, and allowances of lieutenant commander: *Provided*, That the total number of dental surgeons with the rank, pay, and allowances of lieutenant commander shall not at any time exceed ten."

Application for a permit to take the examination should be made to the Chief of the Bureau of Navigation, Washington, D. C., via the Surgeon-general, United States Navy, and according to the form prescribed. This application must be in the handwriting of the candidate and must be accompanied by the following certificates:

(*a*) Letters or certificates from two or more persons of good repute, testifying from personal knowledge to good habits and moral character.

(*b*) A certificate to the effect that the applicant is a citizen of the United States.

(*c*) Certificate of preliminary education. The candidate must submit a certificate of graduation from an accepted high school or an acceptable equivalent.

(*d*) Certificate of dental education. This certificate should give the name of the school and the date of graduation.

(*e*) If the candidate has had special educational or professional advantages, certificates to this effect, signed by the proper authorities, should also be forwarded.

The applicant will save unnecessary correspondence if he will make sure when submitting his application that the qualifications enumerated above are clearly and plainly described in his letters or certificates.

Form of Application. [*]

(This form is not to be filled in here, but copied on a separate sheet in the handwriting of the applicant.)

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SIR: I request permission to be examined for an appointment as dental surgeon in the United States Navy. I was born at........., and was.......years of age on the.......day of............... 191..; am a citizen of the United States, residing in..........., county of............., in the State of............ I am a graduate of...........dental (medical) school, in the State of............, and was licensed to practice dentistry in the State of.............in.........

I forward herewith letters testifying to my moral character, habits, citizenship, preliminary education, professional education, and qualifications.

Very respectfully,

....
(Sign name in full)

THE CHIEF OF THE BUREAU OF NAVIGATION,
Navy Department, Washington, D. C. (via Surgeon-general, U. S. Navy).

A candidate whose preliminary qualifications appear to be satisfactory will receive a formal permit to present himself for examination.

The Examination.

When a candidate presents himself for examination he must bring with him the testimonials as to character and professional fitness, diploma of preliminary and professional education, and a certificate that he is a citizen of the United States, those forwarded with his application being returned to him for this purpose.

The examination is conducted in the following order. I. Moral. II. Physical. III. Professional.

II. PHYSICAL EXAMINATION.

The physical examination is thorough and the candidate is required to certify on oath that he is free from all mental, physical, and constitutional defects. (Applicants are advised to carefully read the special circular regarding physical qualifications inclosed.)

Acuteness of vision, 12/20 for each eye, unaided by glasses, but capable of correction by aid of lenses to 20/20, is obligatory. Color perception must be normal and the teeth good.

If the candidate is found to be physically disqualified, his examination is concluded; if found to be physically qualified, his examination is continued as follows:

III. PROFESSIONAL EXAMINATION.

1. Letter to the board describing in detail his general and professional education.
2. Theoretical (written and oral) in the following subjects: Anatomy, physiology, histology, physics, chemistry, metallurgy, dental materia medica and therapeutics, dental pathology and bacteriology, orthodontia, oral surgery, operative dentistry (theory), and prosthetic dentistry (theory).
3. Practical (clinical) in operative dentistry and prosthetic dentistry.
4. An oral examination is conducted in the following subjects of preliminary education: Arithmetic, grammar, general history, physics, general literature, and Latin. Applicants holding diplomas or certificates from reputable literary or scientific colleges, normal schools, or high schools may submit such diplomas or certificates for the consideration of the board in this connection.

A successful candidate, upon completion of his examination, will be notified by the president of the board that he has been found qualified.

With the consent of the board, a candidate

[* Applications for the DENTAL RESERVE CORPS of the Navy must be made on a special form, which will be furnished on request from the Chief of the Bureau of Medicine and Surgery, Navy Dept., Washington, D. C. Applicants for the Reserve Corps must be between the ages of twenty-one and forty-four years, and must be members in good standing of a state or local dental society. The professional examination for the Reserve Corps is entirely oral, although a practical examination in operative and prosthetic dentistry may be required.—ED.]

may withdraw at any period from further examination, and may at a future time present himself for re-examination. The board may conclude the examination (written, oral, and practical) at any time, and may deviate from this general plan as it may deem best for the interests of the naval service.

No allowance will be made for the expense of persons appearing for examination.

The tenure of office in the Dental Corps of the Navy is for life, unless sooner terminated by removal, resignation, disability, or other casualty.

All officers of the Dental Corps are retired from active service at the age of 64 years, and when so retired (or when retired from active service for disability or other casualty contracted in the line of duty before that age) receive an annual pay for life amounting to three-fourths of the pay of the grade or rank held by them at the time of retirement, including the increased pay allowed for length of service as explained below.

When an officer of the Navy, including dental officers, has been 30 years in the service, he may, upon his own application, in the discretion of the President, be retired from active service and placed upon the retired list at an annual pay for life amounting to three-fourths of the pay of the grade or rank held by him at the time of retirement, including the increased pay allowed for length of service.

Immediately upon official notification of the death from wounds or disease not the result of his own misconduct of any officer of the Navy, the Paymaster-general of the Navy shall cause to be paid to the widow, and if no widow, to the children, and if there be no children, to any other dependent relative of such officer previously designated by him, an amount equal to six months' pay at the rate of pay received by such officer at the date of his death.

When traveling under orders by other than public conveyance, officers of the Navy, including dental officers, receive 8 cents a mile to defray the expenses of such travel performed from point to point within the United States, and when so traveling abroad are allowed actual personal expenses estimated on a liberal basis in accord with the position of the officer, both as regards admissible items of expense and the cost of such items.

For every five years' service the pay of officers is increased 10 per cent. (though not to exceed 40 per cent.), calculated on the annual base pay of their grade, as shown in the appended table.

When an officer goes to sea or leaves the continental limits of the United States under assignment to stations or for the performance of other duties beyond the seas, his pay is increased 10 per cent.

When two or more candidates are examined at the same time, their appointments will be in order of merit reported by the board.

Officers of the Dental Corps are entitled to all the military courtesies and consideration that go with their rank and are accorded to officers of other branches of the service in a similar grade. They wear the same uniform as other officers of the Navy, with a designating device distinctive of their corps.

Pay and Allowance Table.

Length of service.	Pay per annum on shore.	Allowances per annum for quarters.	Total pay and allowances per annum on shore.	Pay per annum at sea.
Dental surgeons, lieutenant (junior grade)	$2,000	$432	$2,432	$2,200
Dental surgeons, lieutenant	2,400	576	2,976	2,640
After 5 years in service	2,640	576	3,216	2,904
After 10 years in service	2,880	576	3,456	3,168
After 15 years in service	3,120	576	3,696	3,432
Dental surgeons, lieutenant commander:				
After 5 years in service	3,300	720	4,020	3,630
After 10 years in service	3,600	720	4,320	3,960
After 15 years in service	3,900	720	4,620	4,200
After 20 years in service	4,000	720	4,720	4,400

For further information address the Surgeon-general, U. S. Navy, Navy Department, Washington, D. C.

Classifying the Drafted.

THE men subject to draft hereafter will be put into five separate classes, running from those who have no dependents to those who are physically or otherwise incapacitated for active service. Men physically fit and with no dependents, who will be in Class 1, are to be called out first, until the entire class is exhausted. After that, Class 2, comprising men with a small family dependent upon them, or men partly skilled, will come. Class 3 will take in highly skilled men, or those with aged parents dependent upon them, while Class 4 will include those with large families. Class 5 will embrace what will be known as the "discards," or men who are in no way fitted for active service. Following is the announcement:

With the completion of the draft of the first army of 687,000 men a new system will be installed for the creation of succeeding armies which will greatly lessen the labors of the local and district boards. So far has this been accomplished that it is believed that under the new system 80 per cent. of the work will be eliminated, while the forms to be used will not exceed 20 in number, as compared with approximately 182 forms which the present system requires.

Along with the reduction of labor there will be provided a system which will classify each one of the 9,000,000 men who have not yet been inducted into military service, and each man will have been given his place in the national scheme of defense.

To do this it has been determined to obtain from each man complete information of a character which will definitely fix his economic worth as compared with his fellow registrant, and from the information thus obtained to place him in one of five classes, each to be called in turn as the need arises.

The method of obtaining this information is through a "questionaire," a series of questions calculated to produce the information required. This document will be mailed to every registrant not yet in service, on a day to be fixed, seven days being given to each registrant to complete and return same. Every opportunity will be offered to each man to complete his questionaire fully and without error.

The local boards will then examine each questionaire and assign each registrant to one of the five classes.

These classes will be based upon every conceivable condition, from the family or occupational standpoint, that should properly be advanced by a man desiring to be excused from military duty. Class 1 will be the first called for physical examination and service, and when it is exhausted, if the nation's needs are such as to make it necessary, Class 2 will follow, and thus each man registered will ultimately take his place if needed.

Every opportunity for appeal from such classification by the local board has been retained and perfected, but proceedings have been greatly simplified.

The tedious work of the local boards has been practically eliminated by the production of a form to be known as No. 1000, which will be the foundation-stone of the new system. Through its use all the laborious work of making and posting lists has been eliminated. All of the old docket sheets and records will be made unnecessary, and by the arrangement of its columns the work of the local board will be reduced to a minimum.

On this new form the complete history of each man's case will appear at a glance, beginning with his order number and ending with his induction into a military camp, while at the close of each day's work the local board is enabled to complete in a few minutes with a rubber stamp what has hitherto taken hours to complete. The system is such that it will present each case almost automatically to the local board.

The completion of the new system will solve problems which have confronted the Provost Marshal-general and caused him much concern.

One of the most serious of these has been keeping together the great organization of the local and district boards, which from a numerical viewpoint is of the strength of an army division; many of these officials have been clamoring for relief on account of the drain on their time, and the new system will make it easily possible for them to continue their duties, for which they have proved themselves eminently fitted.

Another problem solved was the question of the expediency of continuing the examination of the entire registry, thus fixing each man's status. This would have involved a medical examination of each man, whose physical condition might change from day to day, thus making this great undertaking valueless.

Again, under the old system of exemption and discharge, it would have been necessary if the national need required it to send for the exempted man to return for physical reexamination, while in the meantime his industrial or family status might have changed, thus involving endless appeals and confusion.

The new system fixes a man's class, and

calls him in his proper turn, when he is needed. He will be examined physically only when needed.

Thus the labors of the medical officers will be called for only when required. If the nation needs 500,000 men, they will respond, each in his turn as fixed by his class.

The man who can least be spared, either as the head of a family or the head of a business necessary to the defense of the nation, will be the last to go.

The new plan is being made ready for the printer, and will be submitted to the local and district boards in ample time to enable them to familiarize themselves with it, and thus approach their next draft with a thorough knowledge of its requirements.

E. H. Crowder,
Provost Marshal-general.

Army Medical Reserve Corps.

Organization of a Section of Surgery of the Head.

The medical care of one million troops in the field will require the services of several thousand physicians. The Medical corps of the regular army, one of the most carefully selected organizations of medical men, was not sufficient for the present emergency. Primarily, the corps was augmented numerically by the organization of the Medical Reserve corps. By a careful distribution of the men of the regular corps, the influence of their long and thorough training permeated the new organization, forming a completed organization in which those inexperienced in military medicine were safely supported. The medical reserve corps organized, the profession realized its responsibility, and, in consequence, commissions were issued to a large number of physicians throughout the country.

Many of the members of the medical reserve corps were detailed to various medical officers' training camps for the purpose of intensive technical and physical training. This assignment afforded the officers opportunity to obtain physical fitness and sufficient military experience to qualify them as regimental, ambulance, and sanitary officers. It also permitted the weeding-out of the physically unfit, but did not afford opportunity to classify officers according to their professional attainments. The details of this training so consumed the time of instructors and students that it was impossible to judge of the fitness of the officers for special work.

Recognizing the need for specialists, the Surgeon-general, with the General Medical Board of the Council of National Defense, through the great medical bodies of the country, established in his office sections for the care of the various medical and surgical specialties. Physicians of high professional rank, many of them authorities in their chosen field, and in civil life acknowledged leaders, were selected to direct these sections. This plan of classifying the *personnel* of the military medical corps, a new departure, is another example of the far-sighted preparation now so conspicuous in every branch of the service.

The various needs of the service demanded the establishment of eight sections—namely, Internal Medicine, General Surgery, Orthopedic Surgery, Venereal, Skin, and G.-u. Surgery, Surgery of the Head, Laboratories and Infectious Diseases, Neurology, Psychiatry and Psychology, and Roentgenology.

The Section of Surgery of the Head, made up of the sub-sections of Ophthalmology, Oto-laryngology, Plastic and Oral Surgery, and Brain Surgery, developed from a similar organization of the General Medical Board of the Council of National Defense.

In the office of the Surgeon-general, the section as a whole is under the direction of a Lieut.-colonel of the regular corps and to each sub-section is assigned a member of the medical reserve corps. These officers act in an advisory capacity in the selection of *personnel*, etc., and outline the policies under which the work is to be carried on.

Those in charge of Ophthalmology and of Oto-laryngology found their chief function in acquainting the physicians of the country with the fact that the Surgeon-general was desirous of using the specialist as far as possible in his specialty, and in listing the names of the physicians who came into the Medical Reserve corps with a view to work in their specialty. They have aided him to select and assign the proper *personnel* to the base hospitals at the various cantonments. At the present moment the selection of the *personnel* for the base hospitals, which are destined eventually for duty abroad, engages their attention.

The officers in charge of the sub-sections of Plastic and Oral, and Brain Surgery were confronted with the fact of the great scarcity of surgeons familiar with the special technique so necessary in the successful management of injuries of the face and head. It was necessary to use this small group of qualified surgeons to instruct others, and thereby build up a corps of sufficient size to enable assignment of specially trained surgeons to the various hospitals. A conference of the recognized authorities, held in Washington, developed the fact that the large universities were willing to assist in this professional training by tendering to the Surgeon-general the facilities of their medical departments and hospitals.

Schools, with teaching staffs of surgeons versed in the details of special branches, were established. The course of instruction includes anatomy, physiology, symptomatology, operative exercises on the cadaver and animals, splint-making, clinical demonstrations, and didactic lectures.

In the selection of students, the sub-section of Plastic and Oral Surgery first considered a group of surgeons commanding excellent technique but lacking in the necessary special refinements, and secondly, the members of the dental profession, many having medical degrees, who have concentrated their studies upon peridental tissues, the jaw-bones, and structures of the mouth, and are consequently familiar with the special details of the treatment. The correlation of the technique so as to enable the individual surgeon to command the combined knowledge can well be accomplished in these courses.

In like manner the successful neurological surgeon must, in addition to his general surgical training, have some knowledge of neurology, and be trained in the special technique of surgery of the nervous system. The imparting of this special training could best be accomplished by similar schools. With the assistance of the leading members of the profession throughout the country a list of candidates for these schools has been compiled. These candidates in groups of twenty-five are assigned to the schools for a period of intensive fundamental training. When this course is completed, it is planned to give the more competent an opportunity to continue study in the various clinical centers. Selected groups of these officers, well grounded in the fundamentals, can later be more specially qualified through clinical instruction at the front.

In this manner the important period of preparation so necessary for the accomplishment of rapid expansion of all branches of the service will be most wisely used.

When the troops are engaged and many beds of the various hospitals are occupied by soldiers with injuries of the head, assignment of these surgeons who have had special training to assume the responsibility of these cases should result in the utmost efficiency. In the unit of Plastic and Oral Surgery a general surgeon in having associated with him a dental oral surgeon who has gone through a course of intensive training will be fitted to obtain the very best results through their correlated skill. Likewise the officer of the sub-section of Brain Surgery, while necessarily somewhat divorced from the competent neurologist, will have keen judgment, and undertake with clearness his own responsibility.

The fact is evident that it is not the intention of the Surgeon-general to make special surgeons by means of a short course of instruction, but to add the necessary special knowledge to the equipment of the surgeons. This special knowledge will not interfere with the general usefulness of the surgeon in the performance of any duty which may fall upon him as a member of the military medical corps.

T. C. Lyster, *Lieut.-Colonel.*

There has been a suspension of the assignment to duty of Dental Reservists, from the fact that there are no vacancies on the active list. As vacancies occur, assignments to duty will be announced.

Announcement is made that Surgeon-general Gorgas has ordered the establishment in Philadelphia of a school for intensive training in Oral Surgery and Plastic Reconstruction of the Face and Jaws of men who have been maimed in the war. Twenty-five or thirty recently appointed officers of the medical reserve service will be detailed for didactic and laboratory study at the institution.

Dr. Wilmer Krusen, director of Public Health and Charities, has agreed to afford facilities in the dental wards of the Philadelphia General Hospital for clinical demonstrations, and has offered his office in City Hall for meetings of the teaching board.

Dr. Charles R. Turner, dean of the Evans Institute of Dental Surgery, will have charge of the organization of the teaching staff. He will be assisted by Dr. Hermann Prinz, of the institute, in selecting the staff. Lecturers and operators from other medical and dental schools of Philadelphia who are specialists in oral surgery will become members of the staff.—*Army and Navy Register.*

Specialists Needed for the Dental Reserve Corps.

WHILE the Surgeon-general has discontinued for the present examination of applicants for the Dental Reserve corps, as already stated in these columns, two exceptions are made, as follows:

First, since the Medical department will have need of certain dental specialists in various locations in this country and abroad, applications will be considered of such men as are specially well qualified in such branches as the needs of the army may demand. The dental specialists needed at this time are to be found among those who have had experience in the management of fractures of the jaws, and minor or major oral surgery. Applications for appointment in the Dental Reserve corps will therefore be considered of men qualifying in the work above outlined.

Second, when a dentist is drafted, and has been physically accepted by those in charge of the camp where the dentist has been sent as a private, he may then make application for appointment in the Dental Reserve corps through the proper channels to the dental surgeon there in charge, who will promptly have completed papers sent the Surg.-general for final action when an additional number of dental officers are required.—*Army and Navy Register.*

Drafted Dentists Eligible for Commissions in Dental Reserve.

THE following has been sent by the Surgeon-general of the Army to camp surgeons: "You will probably find in your camp a certain number of graduate physicians and dentists who have been called under the selective service law and are now on duty as enlisted men. The fact that these professional men have been called to duty under the draft law does not impair their eligibility for commissions. You are authorized to examine such of them as you wish to apply for appointment in the Medical Reserve corps or the Dental Reserve corps, as the case may be, and if found qualified, to recommend them for appointment. The necessary blank forms and circulars of instruction will be sent you immediately."—*Army and Navy Register.*

Army Dental Corps in Relation to Recent Legislation.

No action has yet been taken on the new legislation, enacted on October 6, in relation to the Army Dental Corps, the Judge Advocate-general not having rendered an opinion on the questions raised as to the interpretation of the statute. As stated in these columns, there will be in this corps a commissioned *personnel* of 9 colonels, 16 lieutenant colonels, 71 majors, and 203 captains and first lieutenants. The necessary promotions will be made by seniority. One of the questions presented is whether previous legislation must apply in the matter of length of service in grades before the advancement of officers may occur. It is observed that the act of October 6th does not repeal the earlier legislation in relation to the dental corps, and contains no allusion to service in grade save in relation to first lieutenants in the Medical department, who shall be promoted to the grade of captain after three years' service as first lieutenant.

New Dental Act Not Applicable to Reserve Corps.

UNDER the provision of the National Defense Act, June 3, 1916, the Judge Advocate-general of the Army publishes a ruling to the effect that appointments in the Dental Reserve corps must be limited to the grade of first lieutenant, owing to the fact that no organizational grades were provided by law in the Dental Reserve corps of the army. The recent legislation reorganizing the dental corps of the army gives the dental corps of the army the same grades as the medical corps. As soon as the War department authorizes these promotions, the Surgeon-general will take up the matter with a view of providing promotions for those qualified for same.—*Army and Navy Register.*

Judge Advocate-general's Ruling on the New Dental Act.

FOLLOWING is the interpretation of the new legislation relating to the dental corps of the army, rendered by Col. H. A. White, acting Judge Advocate-general.

Section 1833, U. S. Compiled Statutes Annotated (Act of March 3, 1911, Chap. 209) creates the Dental Corps. The part of that act in point reads as follows:

"Hereafter there shall be attached to the Medical department a dental corps, which shall be composed of dental surgeons and acting dental surgeons, the total number of which shall not exceed the proportion of one for each thousand of the actual enlisted strength of the army."

Section 10 of the act of Congress approved June 3, 1916, amending Section 1833, Compiled Statutes Annotated, provides: "The Medical department shall consist of one surgeon-general, medical corps, medical reserve corps within the limits of the time fixed by this act, a dental corps. . . . ."

It authorized the President to appoint and commission dental surgeons at the rate of one for each one thousand enlisted men of the line of the army, and provided for the rank and pay of such dental surgeons.

Public No. 86, 65th Congress, approved October 6, 1917, provides: "Hereafter the dental corps of the army shall consist of commissioned officers of the same grade and proportionately distributed among such grades as now or may be hereafter provided by law for the medical corps, who shall have the rank, pay, promotion, and allowances of officers of corresponding grades in the medical corps, including the right to retirement as in the case of other officers, and there shall be one dental officer for every thousand of the total strength of the regular army authorized from time to time by law."

The act further provides for examining and review boards, and recommissioning in the dental corps in the grades therein authorized in the order of seniority, and without loss of pay or allowances or of relative rank in the army.

It is the opinion of this office that Public No. 86 authorized one dental officer for each one thousand of the total strength of the regular army authorized from time to time by law, these officers to be proportionately distributed as in the medical corps and to have grade up to and including the grade of colonel.

Grades and promotions in the Dental Reserve corps. Section 37 of the National Defense Act, approved June 3, 1916, creates the Officers' Reserve corps.

"For the purpose of securing a reserve of officers available for service as temporary officers in the regular army, as provided for in this act, and in section 8 of the act approved April 25, 1914, as officers of the quartermaster corps and other staff corps and departments . . . there shall be organized, under such rules and regulations as the President may prescribe not inconsistent with the provisions of this act, an officers' reserve corps of the regular army. Said corps shall consist of sections corresponding to the various arms, staff corps, and departments of the regular army."

Under the authority given by this section to the President, special regulations—No. 43, War Dep't, March 29, 1917—were published governing the Officers' Reserve corps.

Section 1 of these regulations provides for the organization of the officers' reserve corps and the designation of the several sections of such reserve corps, and authorizes a dental reserve corps as a part of the Medical department.

Section 2: "The grades and number in each grade that may be commissioned in the sections named above . . . . are as follows:" Then follows on page 8 a table indicating the number and grades of the officers of the several arms, staff corps, and departments. In this table the grades in the dental reserve corps are limited to first lieutenants. It will be necessary that Section 2 be modified to authorize the commissioning of officers in the dental reserve corps of the Medical department above the grade of first lieutenant. This opinion deals only with the regular army, and not with the power of the President under sub-section 3 of Section 1 of the act approved May 18, 1917, authorizing the President to provide the necessary officers, line and staff, for the force raised thereunder.

This opinion is considered as removing the factor of service in grade as a qualification for promotion. The examinations will occur as soon as possible, and the promotions will probably create 9 colonels, 16 lieutenant colonels, 71 majors, and 203 captains and first lieutenants.—*Army and Navy Register.*

War Risk Insurance.

THE loss of the army transport Antilles has furnished a striking and timely example of the benefit derived individually from the new war risk insurance. Automatically this insurance applies to the dependents of those who were lost when that transport was sunk by an enemy torpedo. A substantial sum will be paid in monthly instalments over a period of twenty years—this in lieu of the six months' gratuity hitherto prevailing, and as a substitute for less liberal pensions. Under the automatic insurance provision in the law, $25 monthly insurance will be paid to a widow, for example, for 240 months, in addition to the compensation of $25 a month, continued during the life or until remarriage of the widow, or a total of $50 a month. Were it not for the automatic insurance provision she would get only $25 a month. Any person in active service on or after April 6, 1917, is insured automatically until February 12, 1918, inclusive. If the insured person die without having become so disabled, during the period stated, monthly instalments of $25 each will be paid his wife, child, or widowed mother. These instalments are payable to the wife during her widowhood or to the child or widowed mother while they survive him, but not more than 240 instalments will be so paid. If the insured person becomes totally and permanently disabled during the period stated he will receive an income payable in monthly instalments of $25 each during disability. If he die, like instalments are payable to the wife during her widowhood, or to the child or widowed mother while they survive him, but not more than 240 instalments less the number of instalments that may have been paid to the insured while disabled shall be so paid.—*Army and Navy Register.*

"Camp Lewis Dental Society."

To the Editor of the Dental Cosmos:

Sir,—I have been officially instructed to inform you that on the evening of October 23, 1917, a society was formed by the dental surgeons of this camp, and given the name "Camp Lewis Dental Society," 1st Lieut. C. S. Irwin being unanimously elected president. It was agreed that the object of this society is to broaden the knowledge of its members along certain specific lines, mainly that of Oral Surgery and Conductive Anesthesia, demonstrating both in lectures and clinics. The lecture meetings are held on the Tuesday evening of each week, while the clinics are given every Wednesday afternoon. We all look forward to a very instructive course for the following three months.

Very truly yours,
E. J. McClung, *Dent. Surg. U.S.A.,*
Sec'y-Treasurer.

Camp Lewis, American Lake, Wash.,
October 24, 1917.

Dental Reservists' Appointments.

Many of the dental reservists who have been commissioned during the past four or five months and who have not been assigned to active duty are expressing a desire to know when they will be ordered to service. In some cases they appear to have anticipated prompt summons to duty, and have arranged their professional affairs with that end in view. As has been stated in these columns, there are more than enough dental reservists awaiting duty to fill the five hundred vacancies created by the next draft of 500,000 men on the basis of one officer to a thousand men. For the present only vacancies are filled as they occur, and the only appointments made outside of that are to meet extraordinary and special needs of the service. Assignments to duty from the list of inactive dental reservists are made and will be made in no regular order in relation to the date of original commissioning. More depends upon the location of the reservist, his individual qualifications, and the place of duty.

The examination of candidates for appointment to the regular dental corps held at various army posts began on November 12th. The papers will be sent to Washington for marking by a board which will make recommendations of appointment, and which is composed of Major H. E. Johnson and Capts. J. R. Bernheim and J. R. Ames.

Assignments.

Army Dental Corps.

Week ending October 20th.

Capt. S. Davis Boak to St. Louis, School of Plastic and Oral Surgery, Washington University, for instruction and return to his proper station.

The following proceed to United States and report to Surgeon-general of the Army for duty: Capt. Wm. H. Chambers and 1st Lieut. Albert R. White.

1st Lieut. Chester Denham to Camp Taylor.

1st Lieut. J. C. King from Canal Zone to Surgeon-general's office.

Week ending November 3d.

The following to camps for duty: 1st Lieuts. Leslie D. Baskin, Camp Jackson, S. C.; Leslie S. Harlan, Camp Taylor, Ky.; Henry L. Hogan, Camp Sherman, Ohio; Frederick W. Herms, Camp Fremont, Cal.; Robert B. Strickland, Camp Upton, N. Y.; James E. Dean, Camp Doniphan, Okla.; Wm. T. Williams, Camp Sevier, S. C.; Leland S. Wilson, Camp Lewis, Wash., and Walter D. Vail, Camp Pike, Ark.

1st Lieut. Robert H. Mills is entitled to rank, pay, and allowances of captain from May 17, 1917.

Week ending November 10th.

The following first lieutenants to camps for duty: William B. Caldwell, Camp Sherman, Ohio; James R. Conner, Camp Fremont, Cal.; Jerome L. Fritsche, Camp Dodge, Iowa; Clement J. Gaynor, Camp Funston, Kans.; Wm. H. Hoblitzel, Camp Taylor, Ky.; Hooker O. Lindsey, Camp Beauregard, La.; Neil J. McCallum, Camp Taylor, Ky.; William A. Moore, Camp Funston, Kan.; Harold J. Parker, Camp Upton, N. Y.; Milton A. Price, Camp Grant, Ill.; Fletcher D. Rhodes, Camp Pike, Ark.; Boyd L. Smith, Camp Dodge, Iowa; Francis M. Tench, Camp Upton, N. Y.

1st Lieut. Robert L. Lowry assigned to aviation section at Fairfield, Ohio.

The following to camps for duty: 1st Lieuts. Arthur T. Burchill, Camp Upton, N. Y.; John C. Campbell, Camp Lewis, Wash., and Curtis W. Hallam, Camp Lee, Va.

Week ending November 17th.

1st Lieut. Emmett P. Varvel, Schofield Barracks, H. T., to Fort Kamehameha, H. T., for duty, relieving 1st Lieut. Walter L. Reesman, who will proceed to Honolulu and take station for duty, vice 1st Lieut. Albert R. White, relieved.

Dent. Surg. Frank L. K. Laflamme is entitled to rank, pay, and allowances of captain from May 19, 1917.

Capt. Robert C. Dunbar report to chief signal officer for duty.

1st Lieut. Louis Cansler, 5th Cav., detailed to signal corps and to Southern Department for duty.

1st Lieut. Martin T. Chamberlin to Selfridge Field, Mount Clemens, Mich., for duty.

1st Lieuts. John J. Dillon and Loyal D. Palmer to Balloon School, Fort Omaha, for duty.

1st Lieut. Kenneth O. Shrewsbury to aeronautical concentration camp, Garden City, N. Y., for duty.

Lieuts. A. S. Cumming and H. E. Smalley from reorganization camp, Syracuse, to Camp Greene.

Lieut. D. E. Repp to aviation school, San Antonio.

Army Dental Reserve Corps.

Week ending October 20th.

1st Lieut. James B. Harrington to Fort Williams for duty.

1st Lieut. Alphonse L. Senecal to Fort McKinley for duty.

1st Lieut. John G. Stack to Fort Andrews for duty.

1st Lieut. John C. Urban to Hawaiian Department for duty.

The following to places indicated for duty: 1st Lieut. Frank K. Garnar to Fort Banks and Leonard E. Powell to Fort Ethan Allen.

The following from St. Louis to Fort Worth aviation school for duty: 1st Lieuts. Wendell A. Anthony, Earl N. Henderson, and Harold E. Weir.

The following to St. Louis School of Plastic and Oral Surgery, Washington University, for instruction: 1st Lieuts. Jacob Asch, Stephen H. Campbell, Frederick L. Finnegan, Joshua H. Gaskill, Cyrus C. Jones, Arthur H. Myers, John S. Owens, Leroy Tileston, Marvin V. Welcher, George A. Coleman, and Walter H. McCreary.

The following to camps for duty: 1st Lieuts. Albert J. T. Beatty, Camp Gordon, Ga.: Frank A. Cairns, Camp Upton, Long Island; Austin R. Killian and Wm. W. Peet, Camp Grant, Ill.; Raymond G. Shepard, Camp Sherman, Ohio; Weston R. Anderson, Camp Lewis, Wash.; Henry S. Davis, Camp Sherman, Ohio; Lawrence P. Busby, San Antonio, Tex., Camp Kelly; Lee VanSexton, Louisville, Ky., Camp Taylor, and Benjamin Fiedelbaum, Yaphank, Long Island, Camp Upton.

1st Lieut. S. F. French to Fort Oglethorpe.

1st Lieut. John J. Collins to Camp Grant, Ill., for duty.

1st Lieut. Roy Hudson to Camp Travis, Tex., for duty.

1st Lieut. Harry B. Riley from Camp Meade, Md., to Walter Reed General Hospital for duty.

1st. Lieut. Hal N. Orr to St. Louis, School of Plastic and Oral Surgery, Washington University, for instruction, and then to Augusta, Ga., Camp Hancock, for duty in the division of plastic and oral surgery.

The following to Camp Kelly, San Antonio, Tex., for duty: 1st Lieuts. Virgil M. Campbell, Fred L. Edele, Wm. P. Katz, Fayette D. Pendleton, Chester B. Parkinson and Charles W. A. Spies.

Week ending October 27th.

1st Lieut. Edwin T. Foster to Camp Sherman, Ohio, for duty.

1st Lieut. Roscoe C. Funk to Syracuse, N. Y., mobilization camp, for duty.

1st Lieut. George M. Kelly to Camp Dix, N. J., for duty.

1st Lieut. Milzer W. Deist to Camp Grant, Ill., for duty.

1st Lieut. Charles L. Snipes to Fort Douglas for duty.

1st Lieuts. Owen P. Gillick and Harry W. Porter to Camp Devens, Ayer, Mass., for duty.

1st Lieuts. Edward D. Scanlan, Norman E. Gardner, and Bryant E. Hazen to Camp Meade, Md., for duty.

1st Lieuts. Oren W. Wallace and Wm. T. Davidson honorably discharged.

1st Lieut. John R. Quinn to Ayer, Mass., Camp Devens, for duty.

1st Lieut. Erwin I. Herzberg to Camp Grant, Ill., for duty with 35th Engineers.

1st Lieut. Walter T. Avery to Little Rock, Ark., Camp Pike, for duty.

Following lieutenants assigned active duty October 16th:

C. W. Dowd, Camp Grant; W. R. Scanlan, Camp Grant; J. J. Lally, Camp Devens; John McD. Eveleth, Fort Sam Houston; C. W. Raymond, Camp Taylor; A. E. Irving, Camp Kearny; G. F. Brand, Rantoul, aviation school; F. D. Diggs, Camp Greenleaf; R. O. Leonard, Chandler Field, Pa.; R. C. Kiebler, Camp Travis; F. J. Marshall, Camp Devens; W. S. Shuttleworth, Camp Meade; C. B. Hatrick and R. F. Rowdibush to American University camp with 20th Engineers; H. F. Besse to Camp Devens; James M. Adair, Camp Lee; Arno L. Brett, Camp Grant; Harry W. Everett, Camp Funston; Harold C. Gardenier, Camp Dix; James M. Gilbert, Camp Gordon; Timothy J. Greany, Camp Devens; James B. Jones, Camp Gordon; Paul B. Lail, Camp Taylor; Horace E. Metzner, Camp Custer, and Harold A. Tilton, Camp Dix.

Assigned active duty October 17th: 1st Lieuts. Wm. J. Adlington, Camp Devens; Owen I. Bird, Camp Funston; Isaac O. Bishop, Jr., Camp Jackson; Arthur F. England, Camp Lewis; James B. Helton, Camp Gordon; Raymond C. Herman, Camp Dix; Wilbert McKee, Camp Leé; Charles C. Simmer, Camp Custer, and Eugene C. Stamm, Camp Funston

1st Lieut. J. B. Eby to St. Louis, instruction, then to Camp Sherman.

1st Lieut. G. L. Walker to active duty, report to Southern department.

1st Lieut. H. A. Wimberly to Camp Kelly.

Week ending November 3d.

1st Lieuts. Leonard J. Hitz and William G. Neale to Camp Funston, Kan., for duty.

1st Lieut. Theodore G. Boyd to Camp Travis, Tex., for duty.

1st Lieuts. Sturges B. Shields and Frank R. Waite, Jr., to Camp Meade, Md., for duty.

1st Lieuts. Otis H. McDonald and James E. Johnson to Fort Oglethorpe for duty.

1st Lieut. John M. McCausland to Fort Myer for duty.

1st Lieuts. James F. Gildea and Hans C. F. Hille to Camp Dix, N. J., for duty.

1st Lieut. Harry P. Bachman to West Point, N. Y., Military Academy for duty.

1st Lieut. Leonard S. Morvay to Syracuse, N. Y., reorganization camp, for duty.

1st Lieut. George L. Lansdale to Camp Meade, Md., for duty.

1st Lieut. Albion Nyquist to Battle Creek, Mich., Camp Custer, for duty.

1st Lieut. Wall M. Billings relieved from active duty.

Week ending November 10th.

1st Lieut. Ernest M. Gould to Camp Upton, N. Y., for duty.

1st Lieut. Clayton A. Patterson to Champaign, Ill., school of military aeronautics, University of Illinois, for duty.

1st Lieut. Lawrence P. Bushby, Jr., assigned to duty with aviation section, Kelly Field, Texas.

1st Lieuts. Edward S. Bracken, Jr., and John W. Snyder to 20th Engineers, American University, D. C., for duty.

1st Lieut. Rea P. McGee to St. Louis, School of Plastic and Oral Surgery, Washington University, for instruction and to his home.

Following to Philadelphia, School of Plastic and Oral Surgery, Evans Dental Institute, for instruction and return to their homes and relieved from active duty: 1st Lieuts. Robert S. Catheron, Frank H. Cushman, William H. Hynard, Charles E. Waters, Hal O. Cowles, George C. Parry, and Joseph D. Stone.

1st Lieuts. Paul A. Howell and Orlando J. Johnson relieved from active duty.

Resignation by 1st Lieut. Edgar A. Creighton accepted.

1st Lieuts. Edmund F. Lieb and Dan Fulkerson honorably discharged.

1st Lieut. Troy L. Babcock to Fort Worth, Tex., Camp Bowie, for duty.

1st Lieut. Hal Nelson Orr to Camp Hancock, Ga., for duty as dental oral surgeon.

The following assigned to aviation section: 1st Lieuts. Joseph L. Brown and John E. O'Flinn, aviation school, San Antonio, Tex.; Jay M. Hisey, Kelly Field, Texas.

The following to Fort Sam Houston for duty: 1st Lieuts. Kenneth C. Pruden, Lee F. Strickler, Thomas F. Montgomery, and Orvis D. Sanders.

1st Lieut. Frederick L. Finnegan to Fort Oglethorpe for duty.

The following to Philadelphia, School of Plastic and Oral Surgery, Evans Dental Institute, for instruction and will return to stations: 1st Lieuts. Vincent E. D. Bragg, Charles J. Meyer, Stewart D. Ruggles, Wilbert J. Scruton, Ivan E. Smith, Charles W. Swing, John B. Williams, and Peter J. Wumkes.

The following to St. Louis, School of Plastic and Oral Surgery, Washington University, for instruction and will return to stations: 1st Lieuts. William A. Baker, Joseph A. Boarts, William P. Delafield, John J. Ogden, Robert H. Nones, Jr., Arthur C. Rohde, George E. Sandoz, Thomas M. Terry.

1st Lieut. Hal Nelson Orr relieved from active duty.

The following first lieutenants to camps for duty: George C. Booth and Harry E. Bouden, Camp Upton, N. Y.; William W. Peebles and Samuel H. Rosenberg, Camp Dix, N. J.; Lucius A. Butler and Frank C. Carter, Camp Meade, Md.; Edward J. Cobb and James L. Crawford, Camp Sherman, Ohio; Thomas B. Davis and Burrell B. Dehaven, Camp Grant, Ill.; Crawford B. Dowdell and Edward C. Jones, Camp Dodge, Iowa.

1st Lieut. Willard J. Worsley relieved from active duty.

The following to Fort D. A. Russell for duty: 1st Lieuts. Munn Q. Cannon and Solomon J. Z. Gantz.

The following to Fort Sam Houston for duty: 1st Lieuts. Raleigh F. Benham, George H. Carberry, John T. Cosler, Louis M. Daum, Douglas D. Godwin, and Harry F. Gravelle.

Week ending November 17th.

1st Lieut. Alfred Schilt to Camp Lewis for duty.

The following to Houston, Tex., Camp Logan, for duty: 1st Lieuts. Henry T. Dean and Ozias Paquin.

1st Lieut. Herman E. Tipton to Southern Department for duty.

1st Lieut. Abraham H. Leiser to San Francisco, Cal., for duty.

The following to Washington for duty with organizations: 1st Lieuts. James E. Ryan, 301st quartermaster repair unit; Harry E. Patterson, 302d quartermaster repair unit; John H. MacDermott, 303d quartermaster repair unit.

Lieut. G. F. Stodly to aviation school, Berkeley.

Lieut. J. A. Flood from Camp Dix to supply depot, Middletown, Pa.

Lieut. H. B. Laird from Camp Doniphan to Post Field, Fort Sill.

From reorganization camp, Syracuse, to Camp Greene: Lieuts. Monroe B. Bevier, George F. Dalton, Roscoe C. Funk, Joseph H. Jaffer, Daniel Jutton, Frederick F. Mensching, Leonard S. Morvay, and Charles Steffens.

Lieut. A. G. Fee from Camp Funston to Camp Bowie.

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SPECIAL NOTICES.

Stenographers and Typewriters Wanted—Men and Women.

A War Need of the Government.

The United States Government is in urgent need of thousands of typewriter operators and stenographers and typewriters. All who pass examinations for the departments and offices at Washington, D. C., are assured of certification for appointment. It is the manifest duty of citizens with this special knowledge to use it at this time where it will be of most value to the Government. Women especially are urged to undertake this office work. Those who have not the required training are encouraged to undergo instruction at once.

Examinations for the Departmental Service, for both men and women, are held every Tuesday, in 450 of the principal cities of the United States, and applications may be filed with the Commission at Washington, D. C., at any time.

The entrance salary ranges from $1000 to $1200 a year. Advancement of capable employees to higher salaries is reasonably rapid.

Applicants must have reached their eighteenth birthday on the date of the examination.

For full information in regard to the scope and character of the examination and for application blanks address the U. S. Civil Service Commission, Washington, D. C.; or the Secretary of the U. S. Civil Service Board of Examiners at Boston, Mass.; New York, N. Y.; Philadelphia, Pa.; Atlanta, Ga.; Cincinnati, Ohio.; Chicago, Ill.; St. Paul, Minn.; St. Louis, Mo.; New Orleans, La.; Seattle, Wash.; San Francisco, Cal.; Honolulu, Hawaii; or San Juan, Porto Rico.

John A. McIlhenny,
President U. S. Civil Service Commission,
Washington, D. C.

INFORMATION RELATING TO

Qualification for the L.D.S. Degree in Great Britain.

[The following generalized information will be of interest to those who wish to prepare for the British dental qualification. The data given are those which apply to the complete standard curriculum, and are not inclusive of the regulations pertaining to recognition of foreign qualifications or to equivalency of credits for partial courses taken in British and foreign schools respectively. —Ed.]

The method of obtaining a registrable qualification in dentistry resembles that required for medicine and surgery. Both professions are controlled by the General Medical Council. The training of the dental student extends over a period of four years, and may be entirely carried out at a recognized dental school, or it may be acquired by part training at a dental school for two or three years and an apprenticeship of two years to a qualified dentist. The curriculum of the Royal College of Surgeons of England (Queen's Sq., London, W. C.), which is as follows, may be taken as an average of the requirements:

First Course. Theoretical and practical chemistry and physics: 180 hrs. lectures and practical work in chemistry and 120 hrs. lectures and practical work in physics. Pass the prelim. sci. exam. in chemistry and physics—same as that for L.R.C.P. and M.R.C.S.

Second Course. Two years' instruction in mechanical dentistry; lectures on dental metallurgy, with a practical course; lectures on dental mechanics, with practical work, including the manufacture and adjustment of six dentures and six crowns. Pass the 1st profess'l exam.: (1) Mechanical dentistry. (2) Dental metallurgy.

Third Course. Lectures on dental anatomy and physiology, dental histology, dental surgery, with practical dental surgery; surgery of the mouth, dental bacteriology, dental materia medica, and practical instruction in anesthetics—these at a dental school and hospital; and the following in a medical school: Lectures on anatomy, physiology, with practical physiology, surgery, and medicine. Dissections for twelve months. Practice of surgery and clinical lectures on surgery in a hospital for twelve months. Pass the 2d profess'l exam.: (1) General anatomy and physiology, general pathology and surgery. (2) Dental anatomy and physiology, dental pathology and surgery, and practical dental surgery. Before the final subjects are entered for, the candidate must have completed the four-years' curriculum and be twenty-one years old.

Similar conditions apply to the qualifications of the following colleges:

Royal College of Surgeons, Edinburgh. (Clerk, Mr. D. L. Eadie, 50 George Sq., Edinburgh.)

Royal Faculty of Physicians and Surgeons, Glasgow. (Address Mr. Walter Hurst, 242 St. Vincent st., Glasgow.)

Royal College of Surgeons in Ireland, Stephen's Green, Dublin.

Degrees in dentistry are granted by the Universities of Birmingham, Bristol, Dublin, Durham, Leeds, Liverpool, London, Manchester, and Sheffield. The medical schools mentioned above under the section dealing with medicine (with the exception of Charing Cross) have dental colleges attached. There are in addition the following dental schools:

Dublin. School of Dentistry, Lincoln Place. (Dean, Mr. Geo. Sheppard.)

Edinburgh. Dental Hospital and School, 31 Chambers st. (Dean, Mr. W. Guy, 11 Wemyss Place.)

Glasgow. Dental Hospital and School, 158 Renfrew st. and 15 Dalhousie st. (Dean, Mr. W. D. Anderson.)

London. National Dental Hospital, Great Portland st., W. (Dean, Mr. Sidney Spokes.) Royal Dental Hospital, Leicester Sq., W. C. (Dean, Mr. W. H. Dolamore.)—*Chemist and Druggist.*

SOCIETY NOTES AND ANNOUNCEMENTS

NOTICES should reach the Office of the DENTAL COSMOS not later than the 11th or 12th of the month preceding that of publication.

Dental Protective Association of the United States.

THE annual meeting of the Dental Protective Association of the United States will be held at the Palmer House, State and Monroe sts., Chicago, Ill., on the third Monday of December, the 17th, at 4 P.M. sharp. The report of the officers, including the status of the litigation with the Carr patents, will be given; a board of directors will be elected, and such other business transactions as should come before the association.

Heretofore each member has received a postal-card notice of the annual meeting. This will not be done hereafter, for the reason that it was voted by the members at the meeting last year to discontinue the individual notice, substituting therefor the publication of a general notice in the *Journal of the National Dental Association* and all other important journals.

All members are urgently requested to be present.

By order of the Board of Directors:

J. G. REID, *President,*
J. P. BUCKLEY, *V.-pr. and Sec'y,*
D. M. GALLIE, *Treasurer.*

Minnesota State Dental Association.

THE thirty-fifth annual convention of the Minnesota State Dental Association will be held February 7, 8, and 9, 1918, at the University of Minnesota, Minneapolis, Minn.

All members of the National Dental Association are invited to attend this meeting. For information, address

MAX E. ERNST, *Sec'y,*
1125 Lowry Bldg., St. Paul, Minn.

Ohio State Dental Society.

THE fifty-second annual meeting of the Ohio State Dental Society will be held in the Hollenden Hotel, Cleveland, Ohio, December 4, 5, and 6, 1917.

The program promises one of the greatest and best dental meetings ever held. Among the speakers already announced are Drs. T. W. Brophy, J. P. Buckley, N. S. Hoff, Carl Lucas, Richard H. Riethmüller, George H. Fette, and W. H. O. McGeehee. War Surgery will have a prominent place in the program.

A new feature, under the supervision of Dr. Weston A. Price, will be a Seminar, covering the entire field of non-vital teeth—"Evidence, not opinions, to be used," and to be comprised in a series of twelve ten-minute discussions, further exemplified by progressive clinics. Other clinics will cover the field of the management of vital teeth for supporting artificial substitutes.

There will be no general discussions; the entire time will be devoted to papers, lectures, and clinics. The display of dental supplies will be unusually complete, and Tuesday forenoon and Thursday afternoon have been set aside as special exhibitors' sessions.

Come for the first day's program, and bring notebook and pencil.

F. R. CHAPMAN, *Sec'y,*
305 Schultz Bldg., Columbus, Ohio.

Chicago Dental Society.

THE annual Clinic of the Chicago Dental Society will be held in the LaSalle Hotel, Chicago, Ill., January 26, 1918. The program promises to be one of special interest to the profession. Remember the date.

P. B. D. IDLER, *President,*
T. A. BROADBENT, *Sec'y.*

Virginia State Dental Association.

The Virginia State Dental Association will meet in Roanoke, Va., April 25, 26, and 27, 1918.

F. R. Talley, *Corr, Sec'y*,
Petersburg, Va.

Rutland Co. (Vt.) Dental Society.

At the annual meeting of the Rutland County Dental Society, held October 3, 1917, the following officers were elected for the ensuing year: H. H. Yarrington, president; Richard Bunker, vice-president; Grace L. Bosworth, secretary; Thomas Mound, Treasurer.

Grace L. Bosworth, *Sec'y*.

Iowa Board of Examiners.

The next meeting of the Iowa State Board for the examination of applicants will be held at Iowa City, Iowa, commencing December 3, at 9 a.m. For further information address

J. A. West, *Sec'y*,
417 Utica Bldg., Des Moines, Iowa.

Oklahoma Board of Examiners.

The next regular semi-annual meeting of the Oklahoma Board of Dental Examiners will be held in Skirvin Hotel, Oklahoma City, Okla., beginning December 10, 1917. For further information write

H. Overbey, *Sec'y*,
Ryan, Okla.

Texas Board of Examiners.

The Texas State Board of Dental Examiners will hold its next examination in Dallas, beginning Monday, December 17, 1917. No diplomas exchanged; no reciprocity. All applications, accompanied by the fee of $25, should be in the hands of the secretary not later than December 12th. For further particulars and application blanks address

Harrison B. Cave, *Sec'y*,
810-14 Wilson Bldg., Dallas, Texas.

Pennsylvania Board of Examiners.

The next examination of the Pennsylvania Board of Dental Examiners will be held in Musical Fund Hall, 808 Locust st., Philadelphia, and in the University of Pittsburgh, on Tuesday, Wednesday, Thursday, and Friday, December 4, 5, 6, and 7, 1917. The examination in operative dentistry will be held on Tuesday, December 4th, at 8.30 o'clock, in the Philadelphia Dental College, 18th and Buttonwood sts., Philadelphia, and the University of Pittsburgh; prosthetic dentistry on Tuesday, at 1.30. Application papers can be secured from the department of Public Instruction, Harrisburg. Address

Alexander H. Reynolds, *Sec'y*,
4630 Chester ave., Philadelphia, Pa.

Colorado Board of Examiners.

The Board of Dental Examiners of the State of Colorado will meet in Denver, Colo., Tuesday, December 4, 1917, at 8 a.m., for examination of applicants for license to practice dentistry in the State of Colorado.

In addition to the written examinations, applicants must supply their own patients, instruments, and materials, and come prepared to do practical work. Address

R. C. Quick, *Sec'y*,
310 Metropolitan Bldg., Denver, Colo.

California Board of Examiners.

The next examination by the Board of Dental Examiners of California for a license to practice dentistry in that state will be held in San Francisco, beginning on the 7th day of December 1917, at 10 a.m.

All applications for examination must be filed with the board on December 7th. Each application must be accompanied by (1) the fee of $25; (2) necessary credentials (diploma and license from other states); (3) testimonials of good moral character, and (4) a recent unmounted photograph of the applicant.

C. A. Herrick, *Sec'y*,
133 Geary st., San Francisco, Cal.

North Dakota Board of Examiners.

The next regular meeting of the North Dakota Board of Dental Examiners will be held in Fargo, N. D., beginning Tuesday morning, January 8, 1918. All applications and credentials should be in the hands of the secretary ten days prior to the date of examination. For application blanks and further information, write to

W. E. Hocking, *Sec'y*,
Devil's Lake, N. D.

South Dakota Board of Examiners.

The South Dakota State Board of Dental Examiners will hold its next examination at Sioux Falls, S. D., beginning January 7, 1918. All applications must be in the hands of the secretary by January 1st. Fee $25. Address

Robert Jasmann, *Sec'y*, Scotland, S. D.

Montana Board of Examiners.

The Montana State Board of Dental Examiners will meet in Helena, Mont., January 14, 15, 16, 17, and 18, for the purpose of conducting examinations. Applications should be in the hands of the secretary not later than January 1, 1918.

G. A. Chevigny, *Sec'y*,
107 Clark Block, Butte, Mont.

Idaho Board of Examiners.

The Idaho State Board of Dental Examiners will hold their next session in Boise, Idaho, January 14 to 17, 1918. Address

A. M. Jacobsen, *Sec'y*,
255 E. Center st., Pocatello, Idaho.

North Carolina Board of Examiners.

The next meeting of the North Carolina State Board of Dental Examiners will be held at Raleigh, N. C., beginning at 9 o'clock on Thursday morning, January 10, 1918. For further information and application blanks address

F. L. Hunt, *Sec'y*,
Asheville, N. C.

UNITED STATES PATENTS

PERTAINING OR APPLICABLE TO DENTISTRY

ISSUED DURING OCTOBER 1917.

October 2.

No. 1,241,854, to Henry D. Justi. Artificial tooth.

No. 1,241,881, to Alphonse A. Picard. Brush.

No. 1,241,977, to Alexander Hippius. Toothbrush receptacle.

No. 1,242,115, to Percy Russell. Switch for dental instruments.

October 9.

No. 1,242,778, to Arthur R. Darling. Tooth nerve tester.

No. 1,242,821, to Bernard A. Lewis. Dental brush.

October 16.

No. 1,242,956 to Arthur Lewyt. Brush and glass holder.

No. 1,242,989, to Herman Schreier. Attachment for holding dentures.

No. 1,243,335, to Simon Myerson. Artificial tooth.

No. 1,243,386, to Nathan Cohen. Dental suction disk.

No. 1,243,392, to George Evans. Artificial tooth.

No. 1,243,579, to Burpee Oates Bates. Toothbrush.

October 23.

No. 1,244,296, to Walter S. Crowell. Dental cement.

October 30.

No. 1,244,661, to C. K. Teter. Facial inhaler.

No. 1,244,792, to Victor Stoll. Dental tool.

No. 1,244,951, to Arthur W. Browne. Fountain nozzle.

No. 1,244,994, to Hermann H. Leuchsenring. Tooth shade guide.

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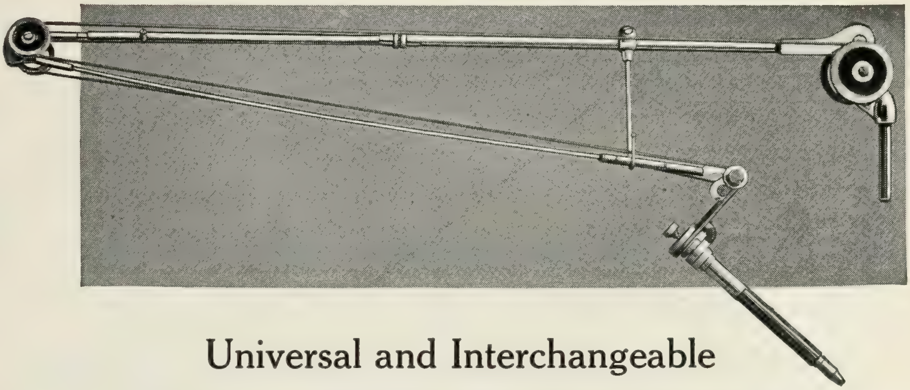

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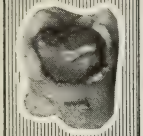
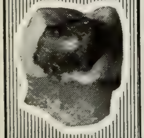


IF the amalgam filling were a rare operation it would probably be better done, and would certainly command a much higher fee than at present. It is another case where familiarity breeds contempt. The improvement of all amalgam fillings would raise appreciably the standing of dentistry in the public mind, because it would raise its service to humanity. It is generally regarded as a cheap but desirable form of restoration. But unless it is made with the same care and scientific precision which characterizes other forms of restoration, it is neither cheap nor durable.

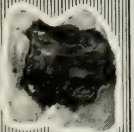
Several principles are involved, but the most important are these:



Thorough Cavity Preparation
Perfect Adaptation
Proper Finishing

At the left are shown a number of extracted teeth, selected as examples of faulty technique and the use of inferior amalgams.

On the right appear tooth restorations made with high-grade amalgam (True Dentalloy), according to approved technique.

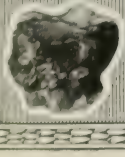


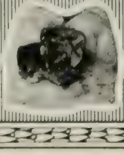
The principles of cavity preparation are understood by all dentists. It is important that these principles be applied as thoroughly in the preparation of a cavity for amalgam as for gold. For if the cavity is not properly prepared, the restoration has "failure" written across it from the beginning.

The second is adaptation. Here the dentist may deceive himself. He may apparently secure it by using a low-grade alloy with a high percentage of tin, which when amalgamated makes a soft, very plastic mass. But when the alloy has set, this adaptation is lost, because of shrinkage. Fortunately, it is no longer necessary to dwell upon that point, for if there is anyone who does not understand the properties of low-grade amalgam, he should never insert an amalgam filling.

Beginning with a high-grade amalgam; there are numerous methods of combining it with mercury, eliminating the excess, and of packing. Whatever the method, success depends upon securing such perfect adaptation that there is left no space to invite the entrance of microorganisms and the recurrence of decay.

Correct finishing is a matter of time and should be considered in determining the fee. It requires little explanation. The cavity must be filled flush with the surrounding walls and the point of contact preserved. The cusps should be carved to restore that which has been lost, and the filling finally polished to give the smooth surface of tooth enamel.





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An essential part of the process is the choice of the right materials. The adaptation of the filling, its strength and appearance depend in large measure upon, first, the alloy, and second, the grade of mercury.

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is not only non-contracting—practically non-expanding, but it is of a degree of fineness and of a crystal structure that enables the operator to pack it against the cavity walls and secure and maintain perfect contact. A coarse alloy, or one with uneven particles does not permit this, inasmuch as not all the larger particles are perfectly amalgamated. *True Dentalloy* is not only balanced so accurately that stability is assured, but in both filings and shavings the particles are so fine and uniform that they readily take the mercury, thus making an amalgam that is easily adapted to the cavity walls.

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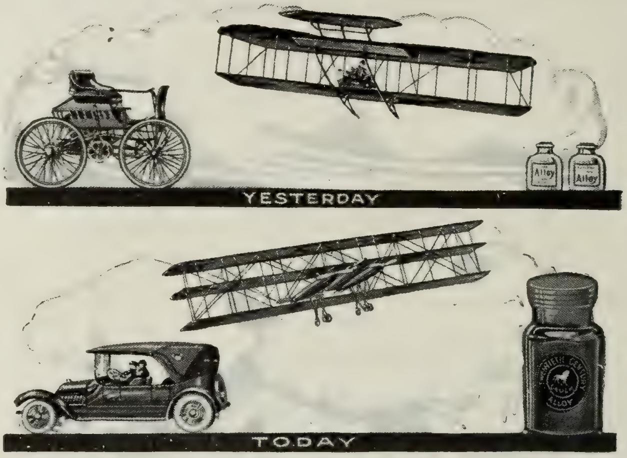

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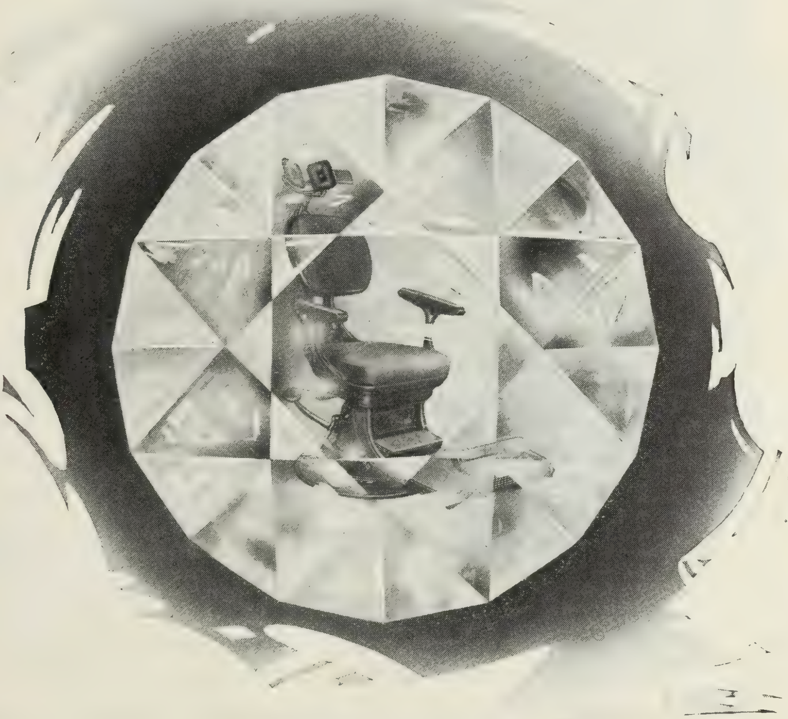

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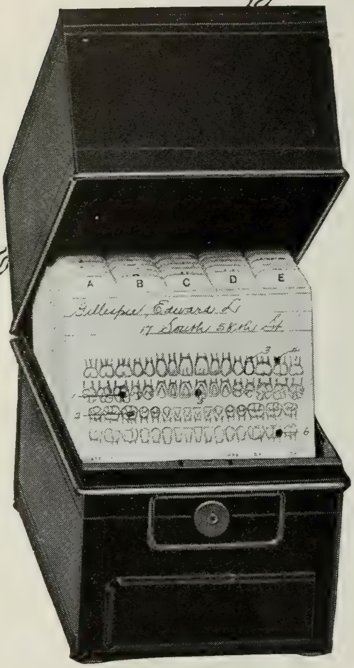

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Because it contains no bismuth to combine with sulfur and sulfur-compounds found in the mouth.

Six colors. Liquids for three speeds of setting
Two convenient packages

Mahogany Six-Color Cabinet	$10.00
Single-ounce Package (one ounce) . .	2.00

Prices subject to change without notice

Your Dealer Will Supply You

Write for descriptive booklet, free on request.

The S. S. White
Dental Mfg. Co.

"Since 1844 the Standard"

Philadelphia

S. S. White
Carborundum Engine Tools

Clean, Fast Cutting
Used Wet or Dry

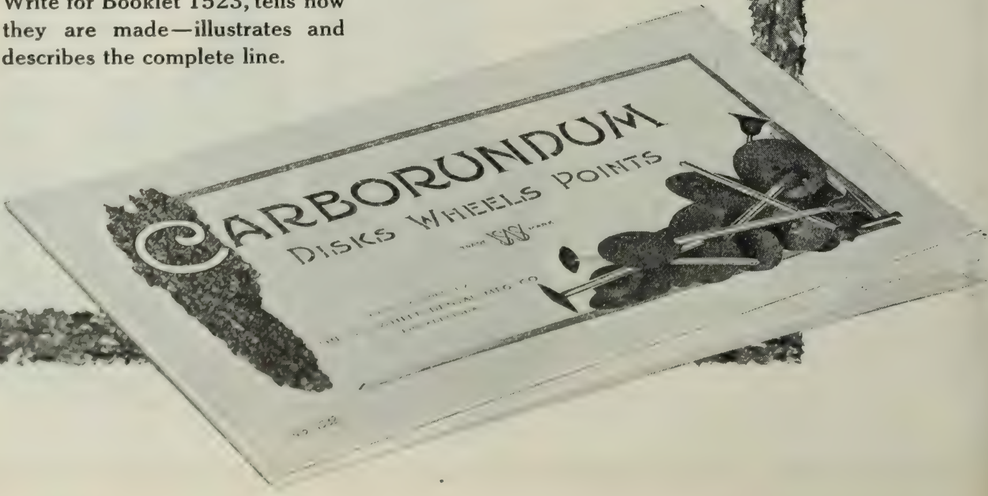
"Know How" methods, the fruits of years of experience and constant endeavor to attain perfection, have brought S. S. WHITE Carborundum Engine Tools to their present high standard of Efficiency and Economy.

For Sale by Dental Dealers
and at our Houses

The S. S. White Dental Manufacturing Co.
"Since 1844 the Standard"
Philadelphia

New York
Brooklyn
Boston
Atlanta
Oakland
Chicago
San Francisco

Write for Booklet 1523, tells how they are made—illustrates and describes the complete line.



Alston Dental Rubbers

For taking a High Polish
For the excellence of their Colors
For Purity, Toughness, Strength and Elasticity

ARE UNEQUALLED

HALF POUND.
S. PINK.
ALSTON BRAND DENTAL RUBBER
THE DENTAL MFG. Co. Ltd.
Principal Depot and Registered Office
LONDON, W.
BRANCHES: MANCHESTER, GLASGOW, DUBLIN, NEWCASTLE & MOSCOW.
ALSTON BRAND LONDON ENGLAND
RED

SAMPLES FREE

FULL WEIGHT, EXCLUSIVE OF LINEN, GUARANTEED

Manufactured by

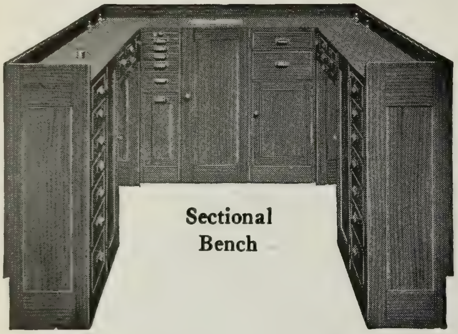
The Dental Manufacturing Company, Ltd.

919 Candler Building NEW YORK CITY 220 West 42d Street

SOLD BY ALL DENTAL DEPOTS

Business is Done

Only Where There is Enthusiasm



IT'S pretty hard to generate enthusiasm for your work when you feel that you must "put up" with old, time-killing equipment. And it is intensely essential that you keep the right environment, the right "working atmosphere"—about you, or your work will suffer, your income dwindle.

This Sectional Bench is enough to inspire any man with enthusiasm! It will make the drudgery not so burdensome, and the tedious hours of seemingly unproductive activity more pleasurable. You will note the broad working surface—the placing of everything where it's available from one spot.

When you see the price and read the full details (on pages 68-71 of our catalog) then your enthusiasm will bubble over. You will find it well within your means to equip properly. You will "do business" with greater enthusiasm—and you will find the days looking better when you get a bench built of sections to just meet your requirements.

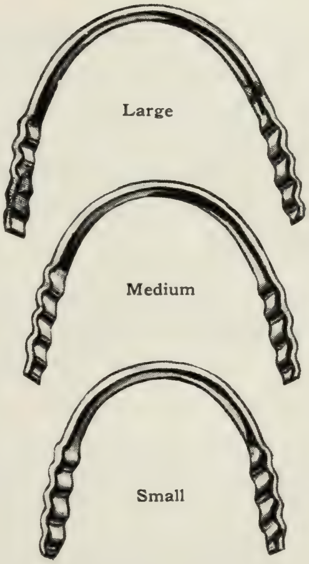
Shall we Send that Catalog?

THE AMERICAN CABINET CO.

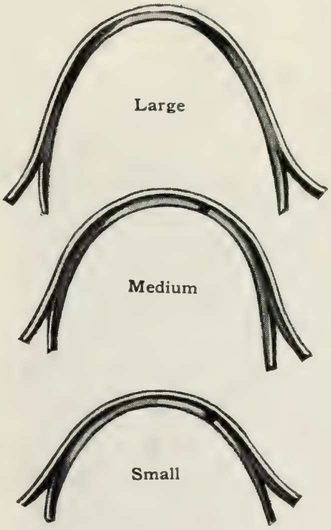
TWO RIVERS, WISCONSIN

SOMETHING NEW

A Cased Lingual Bar Containing No Base Metal



CORRUGATED ENDS



SPLIT ENDS

Casing consists of 20% of the total weight of 18-karat gold. The core is of SOLID HARD SILVER,—NO BASE METAL. $1.30, $1.40, $1.50 each for small, medium and large sizes respectively

SPECIAL OFFER

WE WILL FILL TRIAL ORDERS FOR SILVER-CORE BARS AT $1.00 EACH FOR ANY SIZE

Mention this advertisement

We also make ready-shaped bars in solid-gold clasp metal of various grades and in two grades of cased wire with nickel alloy cores. Send for descriptive circular with prices. Your dealer can supply you.

I. STERN & COMPANY

Manufacturers of Gold Plates, Solders, Shells, Auto-Flux (patented) Solder Strips, etc.

104-106 West 116 Street New York City

If you wish to do other than strictly dental work the

American Interrupter-less

is just the machine you need.

RADIO-UNIT

It takes fine-detail radiographs of the teeth in a fraction of a second and excellent frontal sinus and hip pictures in five seconds. In fact it will take pictures of any part of the body except the heart and lungs.

The American Interrupter-less has rightfully earned its nickname "The Aristocrat" of the dental field.

It is small and neat, yet very powerful, efficient and fast.

Although the Aristocrat is extremely powerful it is surprisingly simple to operate. Just two switches are used, one to start the synchronous motor, the other to turn on the current.

As it contains no interrupter or valve tube there is practically nothing that needs adjusting except the occasional oiling of the motor.

Write to-day for our catalog on the American Interrupter-less, it contains many interesting facts about this wonderful machine that you ought to know.

American X-Ray Equipment Co.

Executive Offices and Factory
MT. VERNON, N. Y.

NEW YORK
50 E. 42d Street

CHICAGO
50 E. Madison Street

SAN FRANCISCO
140 Geary Street

Some Things a Dentifrice Must NOT Do

THE sole *positive* function of a dentifrice is to cleanse—to help the tooth brush remove food deposits. But apart from its efficiency as a cleanser it is of the greatest importance that the dentifrice interfere in no way with the normal physiologic cleansing of the mouth.

It must not inhibit the secretion of saliva.

It must not perceptibly alter the reaction of the saliva.

It must not destroy the ferments of the saliva.

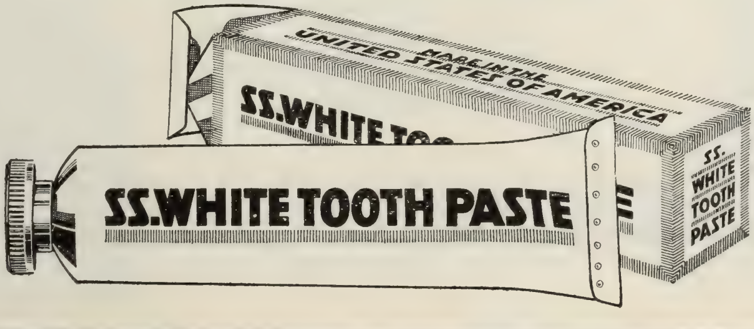
You can prescribe S. S. White Tooth Paste for your patients with full confidence, knowing that it meets these all-important requirements.

Furthermore S. S. White Tooth Paste does not give a deceptive *feeling* of cleanliness. It *cleanses* in a thoroughly efficient as well as a pleasant manner.

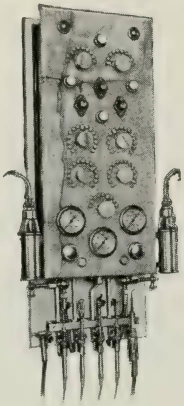
Our booklet "Good Teeth; How They Grow And How To Keep Them" is being widely circulated by health authorities everywhere. We shall gladly supply you with free copies for distribution to your patients.

THE S. S. WHITE DENTAL MFG. COMPANY

211 SOUTH 12th STREET PHILADELPHIA



ELECTRO MFG CO DENTAL



A Switchboard With **66** Uses

SIXTH INSTANCE—THE ROOT CANAL DRIER HAS FIVE USES—AS FOLLOWS:

1. For drying and sterilizing canals preparatory to treating or filling.
2. Facilitates the removal of gutta percha canal fillings.
3. For promoting the action of canal dressing by heating the dressing in place.
4. Good means for applying internal heat in the treatment of periapical and peridental lesions.
5. Has three detachable and replacable silver points, fine, medium and coarse.

And every dentist who does these things mentioned above, by old-fashioned methods, will readily recognize the greater advantage of obtaining better results through the use of the Electro Dental Switch Board and set of practical instruments.

The Electro Dental Switch Board has twelve other instruments with SIXTY-ONE more uses.

Send for catalog and terms.

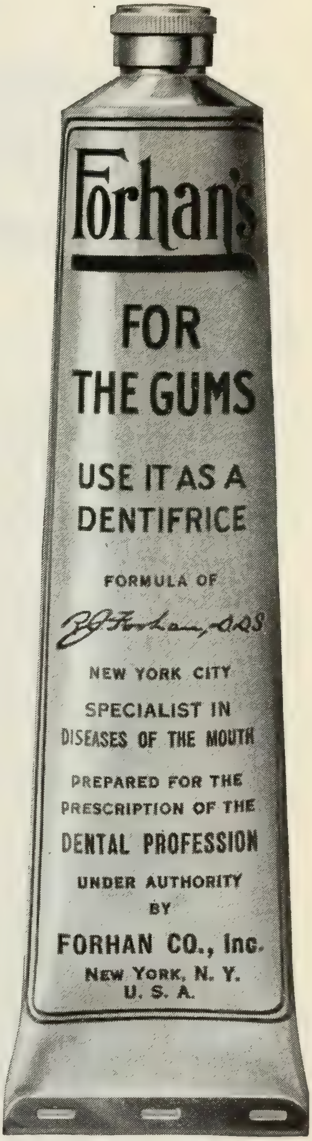
THE ELECTRO DENTAL MFG. CO.
PHILADELPHIA, PA.

Prescribe Something More Than a Tooth Paste for a Diseased Condition

If you are treating a patient for a diseased condition is it reasonable to have him use only a dentifrice? It falls short in convincing him of the necessity of treatment of the gums.

Let your prescription convey the idea that you have prescribed for the patient something which will do more than merely polish his teeth. Let it be of a consistency which will encourage massaging with the fingers.

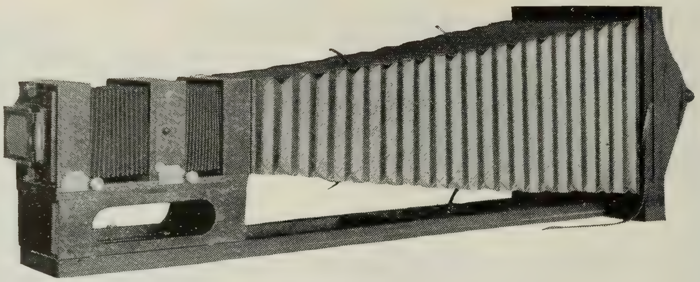
A diseased condition of the mouth requires constant and persistent treatment and the profession has come to realize that Pyorrhea cases should be refused unless the full cooperation of patients can be secured.



FORHAN'S
Forhan's
ORRHEA ASTRINGEN
treatment of PYORRHEA ALVEOL
Ulceration of the Gums, Pyorrhea
PPURATING OR PUS DISCHARGING GU
OF R.J.FORHAN, D.D.S. OF NEW YO
SPECIALIST IN DISEASES OF THE MO
the dental profession ONLY, through dental
direct from us PRICE, $2.00 NET
NET WT. ½ OUNCE
Forhan Co. INC. NEW YORK

Forhan's For the Gums (paste) may be prescribed through druggists, but the liquid Forhan's Pyorrhea Astringent is on sale through dental supply houses solely and is sold only to Dentists—not to the public.

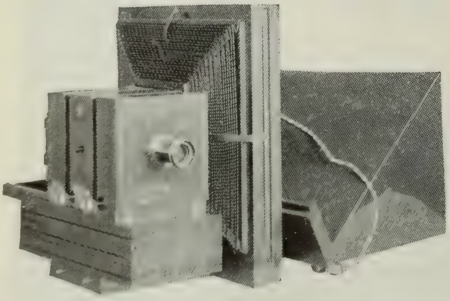
FORHAN COMPANY
200 Sixth Ave. New York



For your convenience, Doctor—

THE EASTMAN X-RAY REDUCING CAMERA

is a simply operated and highly efficient instrument for making lantern slides or other reductions from your X-Ray negatives. It requires but a few moments to assemble; can be used in a room of small size on the top of an ordinary desk or table, and when not in use requires but little space for storage. The Illuminator uses the ordinary house current and is as easily attached as an electric fan.



Eastman X-Ray Reducing Camera ready for storage.

Eastman X-Ray Reducing Camera: Equipment includes Century Lantern Slide Camera (the finest of its type) fitted with both 5 x 7 and Lantern Slide Back; Kodak Anastigmat Lens, *f*.7.7; Illuminator fitted with 100 Watt Bowl Frosted Tip Tungsten Lamp, 110 volts; Kits for 14 x 17, 11 x 14, 10 x 12, 8 x 10, 6½ x 8½ and 5 x 7 plates.

The Price, . , . . $100.00

EASTMAN KODAK COMPANY, Rochester, N. Y.

At your dealer's.

S. S. White

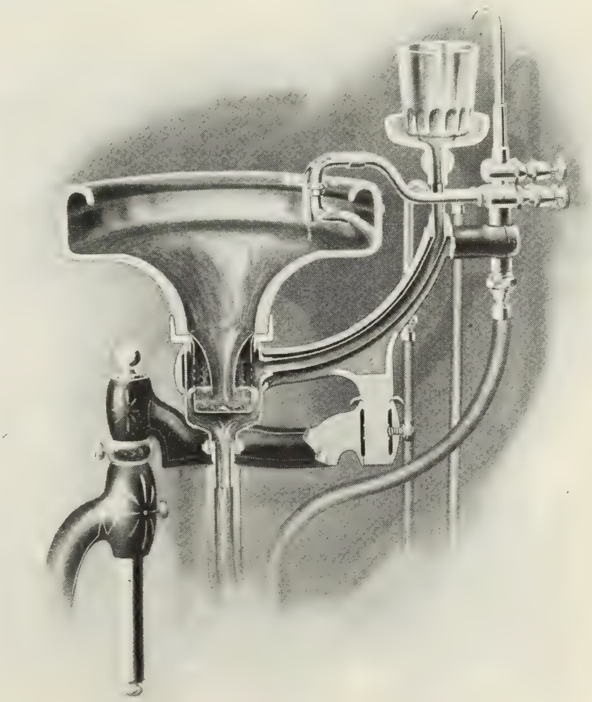
Spiral Flush Spittoon

No. 6

[Patented]

Simple in construction, operates with a minimum flow of water, cleanses quickly—is noiseless and durable.

The single glass bowl is specially designed to reduce risk of cracking from expansion or contraction. The removable strainer cup, suspended in the throat of the bowl, catches and retains all solid matter such as gold trimmings, filings, etc., while blood, saliva and other operating refuse are washed out into the waste tubing through the perforated sides of the strainer cup.



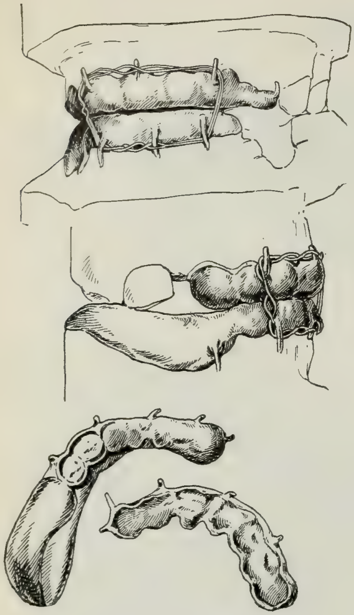
The S. S. White Spiral Flush Spittoon No. 6 is light, graceful, and strong—easily and quickly adaptable to various positions. Handsomely finished in Black japan, White, Gray or Mahogany enamel, with nickel-plated faucets and trimmings.

YOUR DEALER WILL SUPPLY YOU

Illustrated booklet fully describing the S. S. White
Spiral Flush Spittoon No. 6 mailed free upon request

The S. S. White Dental Manufacturing Company
"Since 1844 the Standard"
Philadelphia

Every Dentist Should Have This New Edition



Surgery and Diseases of the MOUTH AND JAWS

A Practical Treatise on the Surgery and Diseases of the Mouth and Allied Structures.

By MAJOR VILRAY PAPIN BLAIR, A.M., M.D., F.A.C.S.

Major Medical Officers' Reserve Corps, U. S. A.; Professor of Oral Surgery in the Washington University Dental School, and Associate in Surgery in the Washington University Medical School.

3d Edition—764 Pages, 450 Illustrations—Price, $6.00

Revised so as to incorporate the latest war data concerning gunshot injuries of the face and jaws. Compiled by the Section of Surgery of the Head, Subsection of Plastic and Oral Surgery of the United States Army.

New Revised and Enlarged Third Edition

THIS edition has been thoroughly revised and reset, and several new chapters added. It has been made the standard of teaching in the schools of head and face surgery organized under the Surgeon-General's direction to be conducted in various cities throughout this country for the purpose of standardizing the treatment of head and face injuries due to war wounds. Every dentist should be interested in getting the information contained in this volume. It focuses all the data on this class of surgery now so important to the dentist that has accumulated since the beginning of the war. This volume also contains the recent work done by Dr. A. D. Black on peridental infection. Every dentist should have this volume. This material has been compiled by the Section of Surgery of the Head, Subsection of Plastic and Oral Surgery, under the direction of the Surgeon-General's office.

Adopted by the United States Army

MANY new illustrations have been added showing the technique of the most improved methods of surgical repair of war injuries to the face and jaws. It probably represents the most approved technique of this class of surgery. Several new chapters have been added.

DENTAL COSMOS

C. V. MOSBY CO.
St. Louis

Dear Sirs: Please send me a copy of the new 3d edition of Blair's "Surg. and Dis. of Mouth and Jaws." Price, $6.00.

Name.................................

Street.................................

Town.................................

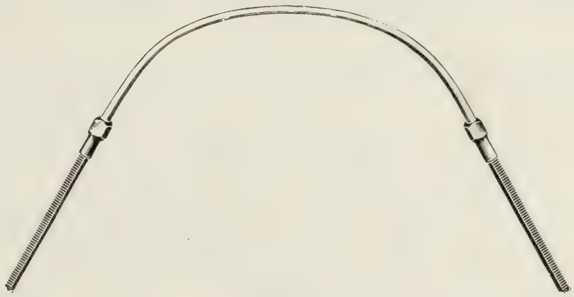
You should have a copy of this new edition in order to keep abreast with the latest work being done along this line—no need to write a letter—just sign the attached coupon and mail

C. V. Mosby Company
PUBLISHERS
801-807 Metropolitan Bldg., St. Louis

The Aderer "Ideal" Expansion Arch

(PATENTED 1908)

Furnished in Platinum-Gold or Gold Alloy



DIMENSIONS OF REGULAR ARCHES

No. 1,	gauge 16,	length 4¾	inches
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Nos. 1, 2, and 3 made to order only

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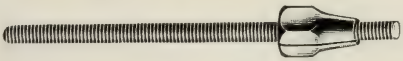
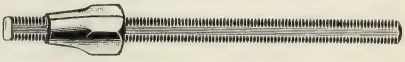
BUCCAL TUBES FOR REGULAR ARCHES
ROUND OR NON-TURNABLE



FRONT VIEW

BUCCAL TUBES FOR BABY ARCHES
ROUND OR NON-TURNABLE



SIDE VIEW

Enlarged Illustration Showing Raised Screw Ends of Our Arches

(Patented 1908)

JULIUS ADERER, Inc.

Manufacturer of Orthodontia Appliances since 1906, and the First to Introduce Platinum-Gold for use In Orthodontia

CHICAGO BRANCH
Marshall Field Annex Building
For Convenience of our
Western Customers

MAIN OFFICE
47 West 42d Street
New York, N. Y.

TRUBYTE TEETH

are the only artificial teeth whose designers understood just what adaptations of natural tooth forms were required to suit the conditions of artificial dentures

TRUBYTE TEETH meet these conditions so well that they may be arranged upon any articulator, or by any dentist with assurance of better results than other teeth permit

THE DENTISTS' SUPPLY COMPANY OF NEW YORK
SOLE MANUFACTURERS OF TRUBYTE TEETH
220 WEST 42ND ST. NEW YORK

FACTS

S. S. White Improved Dental Rubbers are made by balanced formulae

¶ Every ingredient included in the compound has a definite chemical function to perform.

¶ Nothing is added to give bulk or cheapen manufacturing cost.

¶ Caoutchouc, sulphur, pigments—all contribute something to the value of the prepared rubber.

¶ The Veneers as well as the base rubbers have the maximum caoutchouc content.

¶ They are soft working—easily packed, light and resilient, have strength and unequaled covering power.

¶ When vulcanized—the plate has a dense horn-like texture.

¶ Brittleness is never present—tensility always.

¶ Shrinkage does not occur—the vulcanite adapts itself perfectly to the porcelain, its contact approaches adhesion.

¶ Porosity is reduced to the minimum.

¶ The vulcanite shaves under the instrument—does not chip or drag.

¶ The surface takes on a high polish of mirror-like luster and retains it in the presence of moisture.

S. S. White Improved Dental Rubbers are packed with two linen or holland protectors to every sheet of rubber and sold in half-pound boxes. Every box contains full weight of rubber, exclusive of hollands.

Your Dealer Will Supply You

Descriptive literature with prices free on request

The S. S. White Dental Manufacturing Co.
"Since 1844 the Standard"
Philadelphia

An Aseptic Zinc Cement

SMITH'S COPPER CEMENT is an aseptic dressing for the cavity.

When the surgeon binds up the wound he doesn't wait for mortification to set in before he applies a germicide.

He believes in preparedness.

He anticipates the effect by removing the cause.

The formula of SMITH'S COPPER CEMENT is that of oxyphosphate of zinc cement plus copper in a form which

WILL NOT DISCOLOR IN
THE MOUTH

Copper is an antiseptic. It possesses germicidal, therapeutic and sedative properties.

And because the copper in SMITH'S COPPER CEMENT will not discolor in the mouth, it may be used either as a copper cement or as a zinc cement.

It sterilizes the cavity, enabling you to practice surgical preparedness.

SMITH'S COPPER CEMENT is made in 8 light shades in the laboratories of

LEE S. SMITH & SON
MANUFACTURING CO.
PITTSBURGH, U. S. A.

KOLYNOS

In Military Camps

The danger of infection from germ-laden mouth spray is much increased in camps where men are in close contact.

Isolation of infected persons is often impracticable; and sometimes disregarded until forced upon the attention of the over-worked surgeons.

The only prophylactic measure possible to the individual soldier is to secure for himself a sanitary condition of the mouth and throat. Here Kolynos Dental Cream is the Soldier's friend.

Its regular use produces a condition of antisepsis unfavorable to readily imparting or acquiring infections conveyed by mouth spray in the close atmosphere of the barrack.

THE KOLYNOS COMPANY
New Haven, Connecticut

"If you wish to be well served, serve yourself, do not wait for others."

Thousands of dentists are "Serving themselves well"
by the use of

"Dic" Facings (Flat Pin)

(Patented)

BY reading our advertising? No.

BY studying our cuts? No.

BY thinking that the principle is right? No.

BY deciding to try it sometime in the future? No.

The men who have "SERVED THEMSELVES WELL" *protected themselves against fractured porcelain*

Rendered a Decision and Have Taken Action

by demanding that their dealers supply them, or their laboratories use them, as a precautionary measure, as a safeguard against fracture.

If you have been putting this matter off, make up your mind today to insist on "DIC" FACINGS (FLAT PIN) from now on.

Correct Mechanical Construction **50% Stronger**

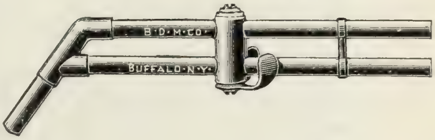
ASK YOUR DEALER

PRICE EACH 40c

Goldsmith Bros. S. & R. Co.

Heyworth Building CHICAGO, U. S. A.
BRANCHES— TORONTO MONTREAL PORTLAND ATLANTA SEATTLE

No. 8-H Buffalo Blowpipe



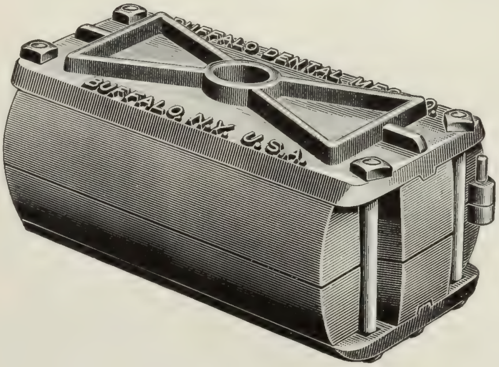
The No. 8-H Blowpipe is by many preferred for general laboratory purposes and is considered especially desirable for melting gold for casting gold inlays.

In holding the Blowpipe, the hand is passed over it, affording a steady grip and complete control for the instant change in direction of flame or alteration in size and character of same. The valve movement is rotative and is controlled by moving the valve wings from side to side with the thumb and index finger.

The capacity and range have been increased so a brush flame larger than usual is obtained and which can be instantly reduced to a nice pointed flame by throwing the valve wings to the right or left. FOR ILLUMINATING GAS ONLY.

Price, No. 8-H Blowpipe $4.50

The Lewis Box Flasks



These Flasks are new in design, and will fill all available space in a Vulcanizer for which they are intended—consequently the internal capacity is greater, enabling a larger piece to be vulcanized than has been possible.

They are very substantial and the contact surfaces of the rings are ground to make a close fit. The covers are thick enough to resist any reasonable strain.

They are made in three sizes to be used in No. 3, 4 1/2 inch; No. 2, 4 1/2 inch and No. 2, 4 inch Vulcanizer.

No. 3, 4 1/2 inch; inside, 7 inches long, 4 inches wide, 2 1/2 inches deep.
No. 2, 4 1/2 inch; inside, 5 inches long, 4 inches wide, 2 1/2 inches deep.
No. 2, 4 inch; inside, 5 inches long, 3 1/2 inches wide, 2 3/8 inches deep.

PRICES: No. 3, 4 1/2 inch, $2.50; No. 2, 4 1/2 inch, $2.25; No. 2, 4 inch, $2.00.

Buffalo Dental Manufacturing Company
Buffalo, N. Y., U. S. A.

Ask for Catalog "C" which tells about our full line of Dental Flasks, made to meet every requirement

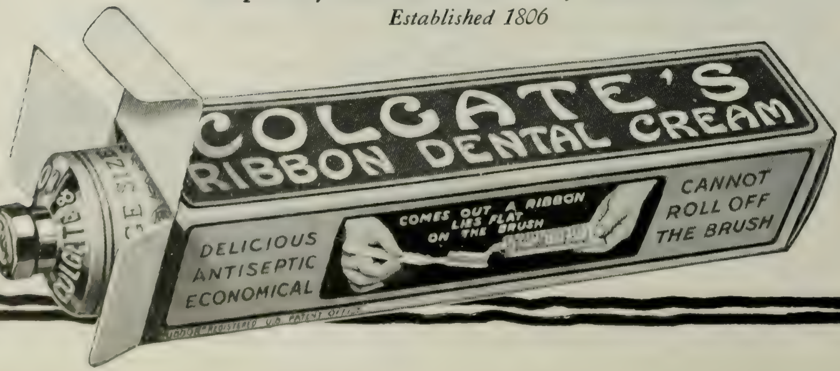
What should a dentifrice be ?

A dentifrice should be equivalent to its definition—"a substance for use in cleaning the teeth." The better it does this the more preferable it is; the *less* it attempts to do the impossible the nearer is it to perfection —a dentifrice with a definite mission and the ability to perform it.

Colgate's Ribbon Dental Cream is a Dentists' Dentifrice—thoroughly relied upon by the profession to cleanse the teeth without injury to any part of the oral cavity. Freedom from risky chemicals and grit makes Colgate's a safe dentifrice for you to recommend to patients as a help to them in perpetuating your own careful work.

Recent impartial investigation has shown Colgate's to be recommended by more dentists than any other dentifrice. Interesting information will be sent you on request. If your supply of Ribbon Dental Cream is nearly gone, a request on your professional stationery or card will bring you a fresh supply.

COLGATE & CO.
Dept. 64, 199 Fulton Street, New York
Established 1806



Onlysafe Sterilizer

[*Patented*]

"All the Name Implies and More"

THE ONLYSAFE STERILIZER is simple in construction, efficient and economical in operation, and durable in service.

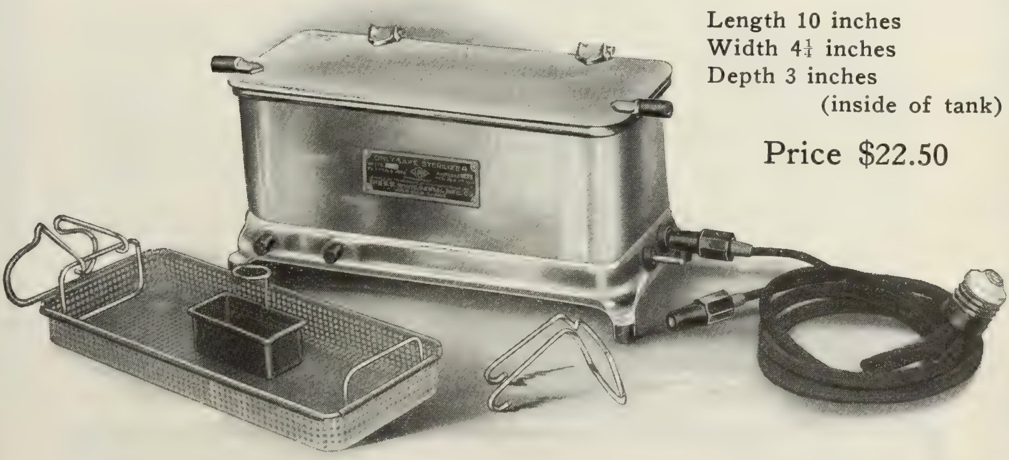
The Onlysafe Switch

The Onlysafe Electric Sterilizer is governed by a thermostatic switch which once pushed on becomes automatic. It controls the simple mechanism of the sterilizer, providing, as desired, a temperature of one hundred and eighty, or two hundred and twelve degrees Fahrenheit. The first keeps the water in constant readiness for work; the second maintains it at the boiling point.

As the sterilization proceeds the water slowly evaporates; when the reservoir becomes dry the slight abnormal heat automatically cuts off the current without destroying so much as a fusible nut. Wires cannot be burned out or the sterilizer damaged from overheating when the chamber is dry. In less than two minutes after the current is turned off the sterilizer is sufficiently cool to receive more water and another tray of instruments.

The Onlysafe Sterilizer is made of heavily nickeled copper and steel and all exposed parts are highly polished.

Made for all standard voltages, alternating or direct current.



Length 10 inches
Width 4¼ inches
Depth 3 inches
(inside of tank)

Price $22.50

Your Dealer will supply you

The S.S. WHITE DENTAL MFG. Co.

"Since 1844, the Standard"

PHILADELPHIA
Sole Sales Agent

Descriptive Literature on Request

PRESCRIBE

PRESCRIBE what? Known qualities and quantities. Don't prescribe mysteries. Don't purchase a dental alloy because somebody talks about "edge-strength, non-shrinkage, absence of flow," etc.

Know what's in it, and then you will have some idea of its virtues.

NEY-ALOY

is a known quantity. It is a product kindred to Ney's golds, solders, etc., "Best Since 1812."

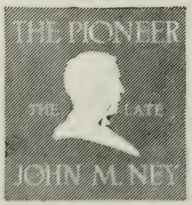
The manufacture of a dental alloy should be a matter of exact science. Pure metals are required; their proper proportions are known; finally, there must be the skill and equipment to bring them together and prepare the product for dental uses. That is all. Whoever does this best makes the best alloy—*let's leave out the legerdemain.*

We have no secrets. The formula is yours. Ney-Aloy is made in one setting only. More than one setting is unscientific; Ney-Aloy is annealed to the point of stability.

Say to the dealer, politely but firmly, "NEY-ALOY."

1 oz. (Troy) $1.50—5 ozs., per oz., $1.40—10 ozs., per oz., $1.30

Approximate Formula:
Silver, 67; Tin, 27; Copper, 5; Zinc, 1



MANUFACTURED BY
The J. M. NEY COMPANY
FOUNDED IN 1812.
Ney. President
HARTFORD, CONN., U.S.A.
For sale by all the principal dealers

NEW GOLD
FOR
OLD GOLD
SILVER
PLATINUM
ETC.

"Who knows but that some day Oxygen will become one of the luxuries of the age?"

said Joseph Priestly, the discoverer of Oxygen, many years ago.

The use of *Oxygen* in

CALOX
The
OXYGEN
TOOTH POWDER

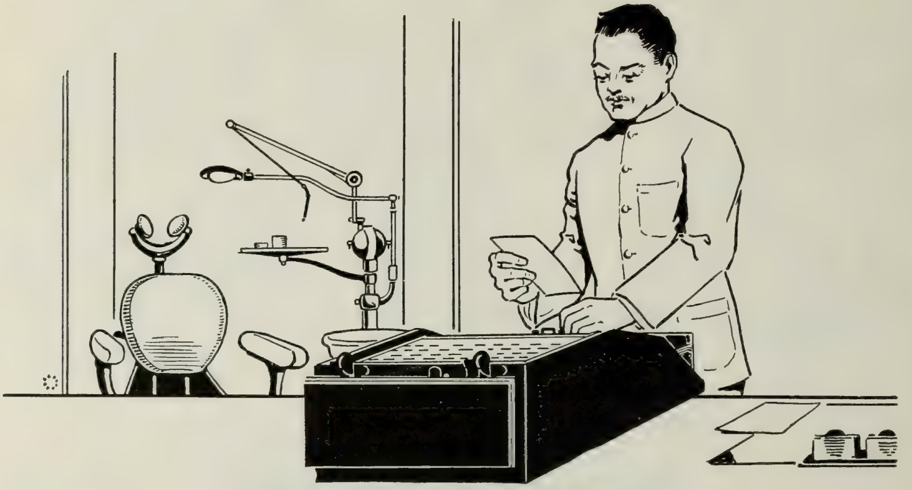
is not only a *luxury*, but is one of the greatest advances in oral hygiene in recent years.

CALOX helps the dentist to help his patient. It fills all purposes of the dental toilet.

PROFESSIONAL PACKAGE and SAMPLES
on REQUEST

McKESSON & ROBBINS
INCORPORATED
Established 1833 NEW YORK

Up-to-date System for Dentists



The N. C. R. Credit File

The N. C. R. Credit File does away with worrisome bookkeeping for the dental profession. No ledgers to post and balance.

It gives at a glance a complete statement of any patient's account balanced to the minute. Each patient's account kept with the minimum of effort.

The N. C. R. Credit File prevents losses. No forgotten charges. Easy to operate. Records protected under lock and key.

The N. C. R. System more than pays for itself from the valuable time and the work it saves. Write for literature about the Credit File for Dentists.

Address Department 4-F

The National Cash Register Co., Dayton, Ohio

Why Dentists Prescribe Pepsodent

Because they know the Dental Profession has never had a preparation which will keep the mouth in such a clean and healthy condition with so little effort on the part of the patient.

Because they know that PEPSODENT contains no pumice, chalk, silex, soap, or free acid. It will not scratch or injure the enamel of the teeth or harm the delicate mucous membranes lining the mouth

Because they know the theory upon which PEPSODENT is based is correct, as evidenced by clinical observations of leading men in the Dental and Medical Professions.

Formula

By W. M. RUTHRAUFF, A.B., A.M.

Pepsin—Dissolves bacterial plaques responsible for decay and pyorrhea	*1.632%*
Acid Calcium Phosphate—Activates the pepsin, the leucocytes, the fibrin ferment and the salivary glands. Is the soluble form in which calcium phosphate in the blood is supplied to the teeth, consequently cannot decalcify them. Is converted by saliva into the tri-basic calcium phosphate of which the teeth are composed	*0.01%*
Precipitated Tri-Calcium Phosphate—A soft, amorphous friction powder, unexcelled for polishing enamel . .	*51.99%*
Calcium Chloride—Hemostatic, astringent, antiphlogistic	*0.004%*
Glycerin, Alcohol and Water, Flavoring, etc. . . .	*46.364%*

You can actually see results.

The Pepsodent Company
2605 Ludington Bldg.
Chicago, Ill.

Please send samples and literature.

Dr. ....

Address..

(Enclose Card or Letterhead)

Does Your Operating Room

inspire confidence in your patients?

An antiquated equipment unquestionably has a direct bearing on the loss of patronage which in turn reduces the value of a practice.

Ritter Dental Equipment in your operating room will accomplish many important things—

It will reduce floor space required.

It will reduce footsteps and thus increase your efficiency.

It will make a lasting impression upon your patients.

It will give you just cause for taking pride in the appearance of your offices.

May we have the pleasure of sending you descriptive literature touching upon our product and service to the profession?

THE RITTER DENTAL MFG. CO.
ROCHESTER, N. Y.
CHICAGO PHILADELPHIA NEW YORK

COLUMBIA DENTAL EQUIPMENT
DISTINCTIVELY DIFFERENT

DONALDSON PULP-CANAL CLEANSERS

Trade-Mark
DONALDSON
Reg. in U. S. Pat. Off. and Elsewhere

The tough, flexible piano-wire from which they're made follows every curve of the canal. The long, spirally-placed backward slanting barbs work their way to the apex with an easy, screw-like motion, grasp the pulp substance firmly and remove it completely. Should the instrument become jammed, a backward turn or two quickly releases it.

Five sizes—Extra Fine, Fine, "B" (between Medium and Fine), Medium, and Large. Two lengths as shown. Packed in rust-proof packages—six cleansers to the package—assorted or separate.

Without handles (short or long) per half doz. $0.75
With handles (short or long) " " " 1.25, each .25

Donaldson Nerve Bristles

are tempered with a "soft spring" which allows the flexible shaft to follow a tortuous canal and resume its shape upon withdrawal.

Three forms: Hooked, for picking out apical fragments; Roughened, for dressing the walls; Plain, for drying and medicating.

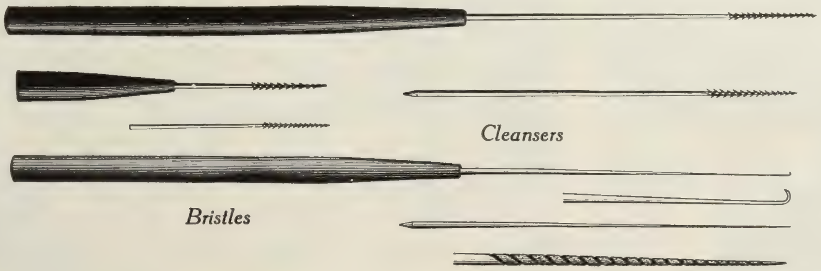
In boxes and packages of half dozen, separate and in various assortments.

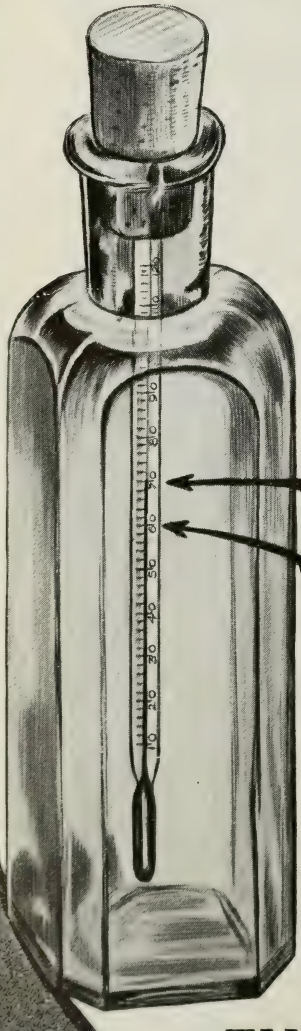
Without handles . . per half doz. $0.75
With handles . . . " " " 1.25, each .25

Your Dealer Will Supply You

Sample package of cleansers free on request—Address Dept. "D"

The S. S. White Dental Manufacturing Company
Sole Sales Agent
Philadelphia





The Ames Mixing Slab

Temperature Control as
Advocated by
Dr. W. V-B. AMES since 1912.

A Mixing Slab of definite temperature is necessary for uniform results.

MIX AMES' OXY-PHOSPHATE OF COPPER CEMENT AT 70° TEMPERATURE

MIX AMES' BERYLITE, CROWN AND BRIDGE AND INLAY CEMENTS AT 60° TEMPERATURE

A cool slab retards chemical action during the mix, enabling the incorporation of sufficient powder to insure proper setting of the cement when transferred to the tooth.

A too high temperature during the mix hastens setting **on the slab,** but gives retarded setting **in the tooth.**

THE SLAB AS ILLUSTRATED MAY BE FILLED WITH WATER OF THE DESIRED TEMPERATURE, AND USED ON ALL FOUR SIDES. SOLD BY ALL GOOD DEALERS OR DIRECT FOR $1.25 COMPLETE.

THE W. V-B. AMES CO.
FREMONT, OHIO

Times Bldg.,
NEW YORK

Republic Bldg.,
CHICAGO

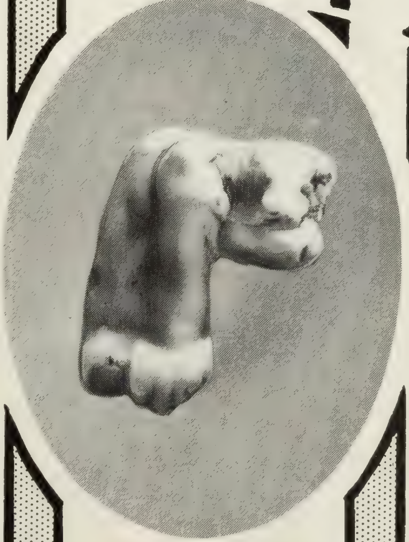
SANITARY SUPERIOR SCIENTIFIC
DSANO PHILADELPHIA
DENTAL PRODUCTS

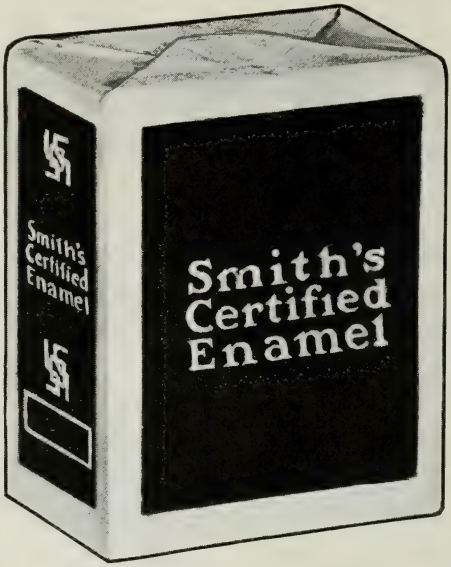
KALO-KAIN

A Present to the Dental Field from
A. P. DE SANNO & SON, INC.
PHILADELPHIA, PENNSYLVANIA

SUCH a monstrosity as the calcified teeth shown here might never present itself in your practice, and yet every day you have operations to perform that require just as deep an anesthesia as did the removal of these "Siamese-twin" molars.

What anesthetic, used infiltratively (direct into the gum tissue) will permit of the *painless* and *immediate* extirpation of nerves in lower molars? Kalo-Kain will do this—and we never have heard of any other. The Kompleet Kit, with leak-proof syringe and with needles of the proper length, costs but $5.50. The Kalo-Kain itself is $1.50 per box of 12 ampules. Send your Harrison blank today, made out to us and signed; tell us whether you want the kit or just the Kalo-Kain and begin with KALO-KAIN NOW.





Have you made a mix?

In October, samples of Certified Enamel were mailed to every Dentist in the United States. The material was relied upon to demonstrate its own characteristics.

It has.

"I have come to the conclusion that you people do not claim enough for the product" writes a California dentist.

His letter is typical.

He has made a mix. He has inserted fillings and has watched them.

So he knows.

He has *discovered* what Certified Enamel really is.

His own spatula and his own mouth-mirror have told him very much more than we did. Have yours?

In other words—have you made a mix?

LEE S. SMITH & SON
MANUFACTURING CO.
PITTSBURGH, U. S. A.

Smith's Certified Enamel is now at dealers everywhere

ALBODON
THE IDEAL DENTAL CREAM

What Sometimes Happens to Camouflage

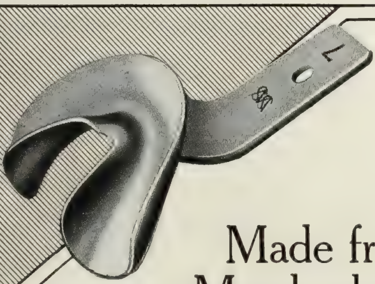
It is no secret to any sophisticated dentist that the motive of the dentifrice manufacturer in sending him samples is to encourage through him the more general brushing of the teeth—and with his particular dentifrice, of course! The package of samples goes on its way with a sort of camouflage feeling of a "lively sense of favors yet to come."

A sincere, earnest-looking dentist stopped at our Booth at the National Convention at the Astor. "Ah, there's ALBODON," he said. "You have the best Cream on the market, barring none. I tell you, I get samples of nearly all of them, and I give them to my patients. *But I keep ALBODON for myself and wife.*"

Are *you personally* using ALBODON, and are you *telling your patients* about it? Don't keep a good thing a secret!

THE ALBODON CO., 154 West 18th St., New York

—MERIT ULTIMATELY WINS RECOGNITION—



S. S. White Impression Trays

Made from a special formula of Brittania Metal which produces an alloy of wonderful adaptability—rigid enough to stand the stress of service, easily bent to variations of form, readily cut, quickly cleaned.

S. S. White Impression Trays are sold in a wide variety of forms and sizes for every type of Orthodontic and Prosthetic Impression-taking.

Your Dealer Will Supply You

The S. S. White Dental Mfg. Co.
"Since 1844 the Standard"
Philadelphia

A Wax With
Cement-like Characteristics

that is especially valuable in soldering operations. For years it has been the reliance of crown- and bridge-workers because it:

Sets firmly with plenty of strength.
Holds the set-up teeth rigid for soldering operations.
Clings tenaciously to any surface.
Breaks with a clean, sharp fracture.
Is readily removed when necessary, leaving the plate and backing clean.

Sold in boxes of 18 round sticks. Price per box, $0.50

Your Dealer Will Supply You

The S. S. White Dental Manufacturing Company
"Since 1844 the Standard"
Philadelphia

Nervodyne
Trade Mark Registered

Specific for Pulpitis!

Painless Devitalizer

Harmless, Effective, Dependable

NERVODYNE contains a very little arsenic, and $\frac{1}{200}$ gr. of cocain to the treatment—300 treatments in each jar.

DR. M. E. HISEY'S
NERVODYNE
Devitalizing Paste and Anodyne
Acts as an Anodyne as well as a devitalizing agent. Applied to an irritated or exposed pulp will stop toothache immediately.
The Ransom & Randolph Co.

Stops Toothache in One Minute

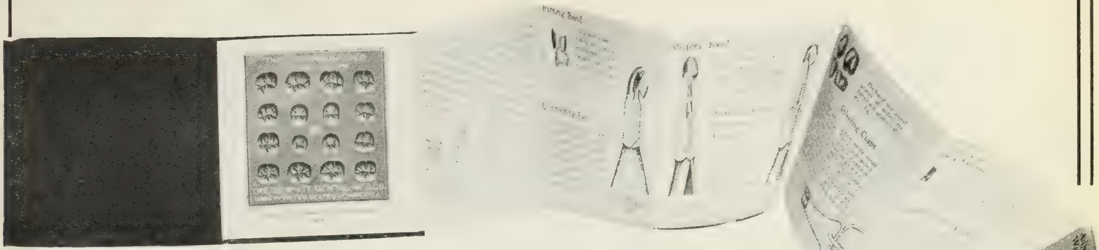
Prevents Extraction
Builds Practice
Increases Income

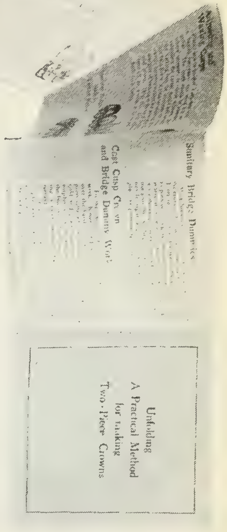
Costs, per treatment, two-thirds of one cent! It is very well worth while.

PRICE, $2.00 PER JAR

Order from your Dealer, using Government blanks

THE RANSOM & RANDOLPH COMPANY, Toledo, O., U. S. A.





Write for This Booklet

Illustrating and describing a
Simplified Die-Plate
having unlimited adaptability

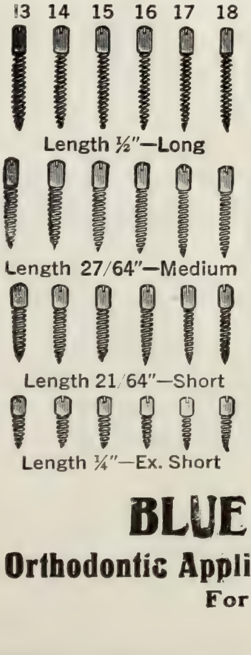
The L. M. FARNUM DIES

[Patented]

The S. S. White Dental Mfg. Co.
"Since 1844 the Standard"
Philadelphia

SCREWPOSTS

For Amalgam Restoration, Bridgework Abutments and Anchoring Inlays



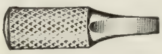
One dozen Screwposts in box, packed each one in a sanitary aseptic translucent capsule, assorted sizes, any length or of any size with key or screwdriver, price . $1.25

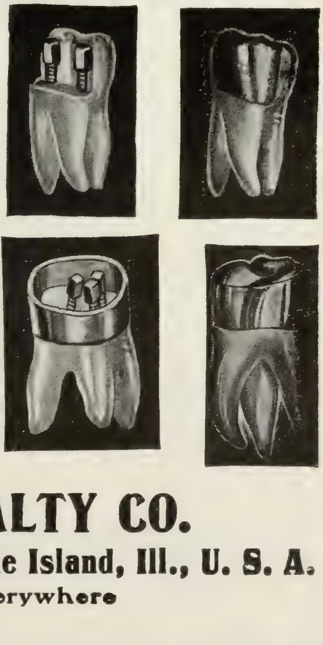
Without key or screwdriver $1.15

Precious metal prices on application.—18 kt. gold, gold platinum, irid. platinum.

Key
Price 10c

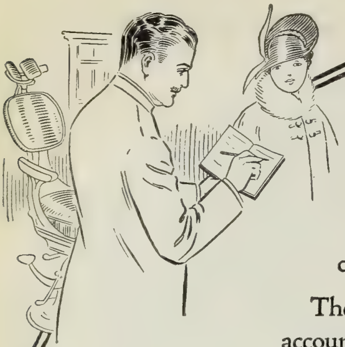
Screwdriver
Price 10c





BLUE ISLAND SPECIALTY CO.

Orthodontic Appliances and Supplies Blue Island, Ill., U. S. A.
For Sale by Dental Dealers Everywhere



S. S. WHITE APPOINTMENT BOOK No. 7

Every Day, Every Half-hour

Appointments are scheduled from 8.30 a. m. to 7 p. m., Sundays included, in this Practical Dentist's Appointment Book.

There are fifty-four weeks' appointments, twelve monthly cash account rulings, a page for cash summary and calendars for five years, 1917 to 1921, all comprehensively arranged.

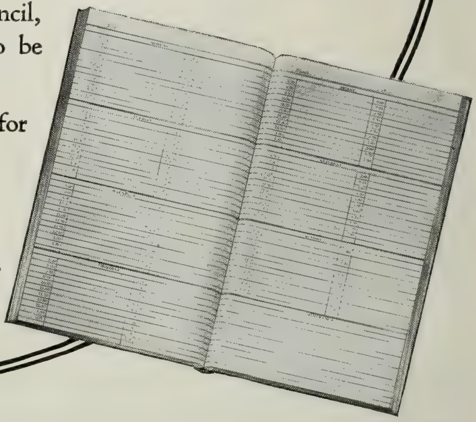
The book is of convenient size 5¾ x 9 inches, printed on fine white paper equally suitable for ink or pencil, handsomely bound in rich, red pantasote, claimed to be more durable than morocco.

Perpetual in form, can be started any time and used for a year.

Price $0.75

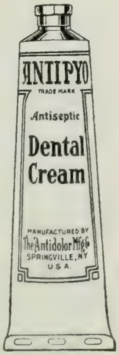
Your Dealer Will Supply You

The S. S. White Dental Mfg. Co.
"Since 1844 the Standard"
PHILADELPHIA



ANTIPYO

Dr R.B.Waite's formula



ANTIPYO is a perfect cleanser, which whitens and polishes the surface of the enamel. It is not only a cleanser, but it is also a healer and preventive of diseases of the mouth, being designed to check the growth of bacteria.

ANTIPYO stimulates and tones the oral tissues in such a way as to increase their resistance to germ attack. It neutralizes acid conditions, thus arresting fermentation. Its antiseptic and astringent properties are invaluable for soft, spongy and bleeding gums.

ANTIPYO Mouth Wash and Dental Cream combine both cleansing and antiseptic properties in an unexcelled degree. The antiseptics are not so strong as to injure the delicate mucous membrane of the mouth, but in the right proportion to check the growth of bacteria. The Cream is velvety smooth, without harsh grit, which cleanses without scratching the surface of the enamel.

FOR PYORRHEA ALVEOLARIS, CLEAN TEETH, FIRM GUMS, HEALTH

Order of Your Dealer

WHOLESALE PRICE TO DOCTORS
$2.00 per doz. 2-oz. Bottles Mouth Wash or 25c Tubes Dental Cream
$4.00 per doz. 6-oz. Bottles Mouth Wash or 50c Tubes Dental Cream

THE ANTIDOLOR MANUFACTURING CO., Springville, Erie County, N. Y.

S. S. White Paper Disks

"The Grit Stays On"

Made For Efficient Service

You'll find every S. S. White Disk a good disk—clean cut, evenly charged, accurately centered, stiff, tough and moisture-proof.

S. S. White Paper Disks are charged with Carborundum, Cuttlefish, Sand, Garnet and Emery in a variety of grits. Five sizes, 3/8 in., 1/2 in., 5/8 in., 3/4 in., 7/8 in. Crocus and French Emery-Paper Disks are made in same sizes, but one grit only, as fine or finer than Cuttlefish.

The Handy Round Tray, $1.75

is the most convenient form of package. Contains complete assortment of 1400 Paper Disks arranged in compartments according to diameter and kind.

Compartments can be readily replenished by purchasing

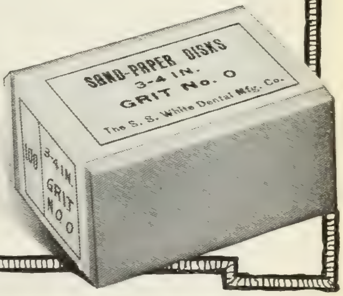
Boxes of 100 Disks, any grit, kind or size. Per Box, 12c.

Your Dealer Will Supply You

The S. S. White Dental Manufacturing Co.

"Since 1844 the Standard"

Philadelphia



TRADE SSW MARK

Long Enduring Service

is the standard by which the value of Dental Engine Belts is measured.

After an S. S. White Emerald Engine Belt has gone through an amount of work that would wreck any other dental engine belt, there is still left greater service than it has already given.

S. S. White Emerald Engine Belts

Belt No.	202,	for S. S. White	Electric	Folding-Bracket	Cable	Engine,	2 ft.	2 in.,	each	$0.50
" "	811,	" " "	"	" "	Belt	"	8 "	11 "	"	.50
" "	901,	" " "	"	Swivel- "	Cable	"	9 "	1 "	"	.50
" "	1305,	" " "	"	" "	Belt	"	13 "	5 "	"	.60

Proportionate prices for other regular belts for foot and electric engines of any style or make. Special Emerald Belts made to order at the minimum price of $0.50 for Belts of 5 feet or less, 2c more for each additional foot.

Your Dealer Will Supply You

The S. S. White Dental Manufacturing Company

"Since 1844 the Standard"

Philadelphia

TEMPORARY STOPPING.
(DRESSING SEAL.)
MADE IN UNITED STATES OF AMERICA
THE S. S. WHITE DENTAL MANUFACTURING CO.

S. S. White Temporary Stopping

"Best by Every Test"

As a medicament seal; as a permanent root-canal filling; for lining a sensitive cavity or for any other purpose where a gutta-percha stopping is useful, S. S. White Temporary Stopping is unsurpassed.

Once placed it "stays put" as long as required — there's no danger of a leaky seal. It keeps the medicament in — the bacteria out.

S. S. White Temporary Stopping softens at a low heat. It contains a large proportion of gutta-percha, which gives it a stickiness to cling closely to the cavity walls. S. S. White Temporary Stopping works smoothly and is readily packed with minimum pressure and will not contract after setting.

In sticks. Two Colors, Pink and White. Two sizes, ⅛ and $\frac{3}{16}$ inch
Box contains a full ounce, both sizes, all white or pink or assorted, $0.60; 6 boxes for $3.00

Your Dealer Will Supply You

The S. S. White Dental Mfg. Co.
"Since 1844 the Standard"
Philadelphia

Ten Reasons— There are at least ten reasons why every dentist should use

"GOLDDUST" RUBBER

(Trade Mark Reg. U. S. Pat. Off.)

and here are the ten: "Golddust" Rubber is

Easier to pack
Low in specific gravity
Exceptionally strong
Durable
Easily polished
Absolutely non-porous
Non-heating to tissues
Comfortable to wear
Economical to use
Beautiful in appearance

Best of all is the reason: "A satisfied patient will more readily pay your fees."
There are NO REASONS for NOT using "Golddust" Rubber.

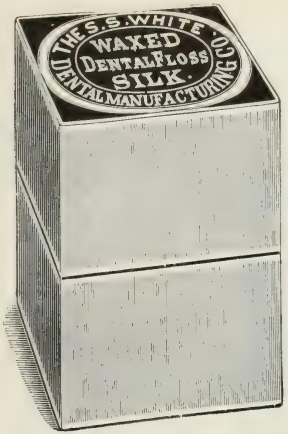
Send in the coupon for a sample box FIRST

PRICES

$5.25 per pound $2.63 per half pound
1/6 pound sample box (about 5 sheets) $1.00

ATLANTIC RUBBER MFG. CORPORATION *Sales Agents for*
TRAUN RUBBER COMPANY
239-243 FOURTH AVENUE *Dept. D.C. 12* NEW YORK

D.C. 12
Enclosed
$1.00 for sample
box of "Golddust"
Dr. ____________


THE S.S. WHITE DENTAL MANUFACTURING CO.
WAXED DENTAL FLOSS SILK.

S. S. White Waxed Floss Silk

In *S. S. White Floss Silk* will be found an especially efficient combination of the three desired features:

Proper Waxing, Strength and Smoothness

The proper waxing of S. S. White Floss Silk permits it to enter very narrow spaces; its strength enables it to withstand the strain incident to its use without breaking, and its smoothness prevents it catching or knotting in the interspaces.

That it is *indeed* an excellent ligature a trial will clearly demonstrate.

12 yards, per box, $0.12; doz. boxes, $1.25
24 yards, per box, $0.20; doz. boxes, $2.20

Your Dealer Will Supply You

The S. S. White Dental Manufacturing Company
"Since 1844 the Standard"
Philadelphia

THE S.S. WHITE DENTAL MANUFACTURING CO.
DENTAL FLOSS SILK.

USE LAVORIS TRADE MARK The Original ZINC CHLORIDE ANTISEPTIC

IT WILL GIVE YOU THE **GREATEST POSSIBLE ASSISTANCE** IN YOUR PRACTICE

BECAUSE THE ZINC CHLORIDE IS IN A PERFECT AND PERMANENT SOLUTION & YOU GET THE FULL THERAPEUTIC VALUE OF IT.

·AND·IT·IS·SO·VERY·PLEASING·TO·USE·

The Sticking and Wearing Properties are Proof of the Chemical Exactness in Manufacture of

FLECK'S RED COPPER CEMENT
SETS RED REMAINS RED
THE ONLY RED COPPER CEMENT
CONTAINS METALLIC COPPER IN ATOMIC FORM
FLECK'S CEMENT
THE PERFECTED FORMULA OF HERMAN FLECK PH.D.
TRADE
MARK
ORIGINATOR OF "PETROID"
MADE BY
THE J.R.STANLEY CHEMICAL CO.
NEW YORK
FLECK'S CEMENT
HAS A DOUBLE GUARANTEE
THE MANUFACTURERS AND YOUR DEALERS

Save 33⅓% **and use the best**

HIGHEST QUALITY, LOWEST PRICE

THE J. R. STANLEY CHEMICAL COMPANY
1 UNION SQUARE, NEW YORK CITY

When in doubt as to a possible Cardiac or Respiratory Lesion
USE ONLY

Novol

Local Anesthetic with Adrenalin Tablets

And observe the absolute absence of toxicity and the rapidly healing wound.

And also remember that the suprarenal extract, being unstable in solution, is supplied in stable tablets, so that you may make a fresh Adrenalin solution when needed.

2-oz. bottle, $0.80; 4-oz. bottle, $1.50

Ask Your Dealer Today or Write to

NOVOCOL CHEMICAL MFG. CO.
485-487 GLENMORE AVE. BROOKLYN, N. Y.
Narcotic blank required

Tear this off and mail to us with Harrison Blank

Send me through my dealer a 4-oz. bottle Novol Local Anesthetic. If, after a thorough trial, I do not find it satisfactory, I am to return it for full credit.

Dr. ....

Dealer ....

KERR EX-O-DENT

REG. U. S. PAT OFF

CHEWING GUM

A Pure, Hard Chewing Gum

Recommended by dentists and especially prepared for their patients.

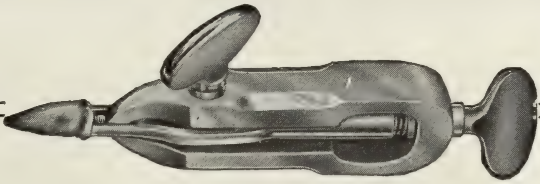
One of the numerous recognized causes of irregular teeth in children and soft gums or pyorrhea in older people is the lack of sufficient exercise of the jaws and teeth due to eating soft and soaked foods.

The chewing of Kerr Ex-O-Dent Chewing Gum furnishes the much needed exercise and actually aids development.

The gum is so hard that the patients' jaws become tired in 15 or 20 minutes, when chewing should be discontinued.

Price per box (containing 6 packages of 5 sticks) $0.50

DETROIT DENTAL MFG. CO. **Detroit, Michigan, U. S. A.**



"My Time is Valuable"

Every dentist's time is valuable. That and his knowledge go to make up his service to his patients. Therefore, when he says "My time is valuable" he does not do it to merely keep away the all sorts of bothersome solicitors, but he does it because it represents his attitude of mind and condition of circumstances.

Imagine yourself then of spending unnecessary time and labor in pulling away at broken-off crown pins or posts, possibly for half an hour or more, when you have a method at hand that will do it in as little time as it takes to read this ad.

The "LITTLE GIANT" extracts broken-off crown pins or posts in about three minutes—saves the "patience of your patients" as well as your own, much inconvenience and labor and pays for itself in a very short time. If you haven't one already, don't delay another day the pleasure that a "LITTLE GIANT" will give you when its use is needed.

Price $3.50, at your supply dealer's; if he does not have it, you can get it from us.

F. H. SKINNER

25 E. WASHINGTON ST. **CHICAGO**

Dentalone

Local Anesthetic. Disinfectant. Antiseptic.

Dentalone is a saturated solution of Chloretone (approximately 33%) in the oils of cloves, cassia and wintergreen.

Dentalone is particularly serviceable in odontalgia, its anodyne effect, when applied to exposed nerves in decayed teeth, being markedly prompt. It is used without dilution.

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is unirritating and slightly stimulating in its effect upon the salivary glands, thus favorably influencing the maintenance of the normal salivary mouth-bath which Nature provides for the care and preservation of the teeth and mouth tissues.

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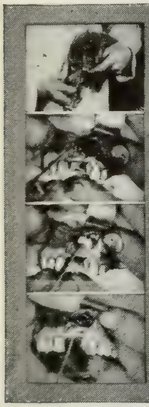

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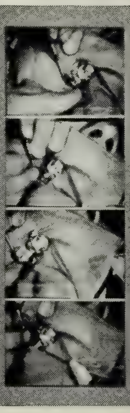

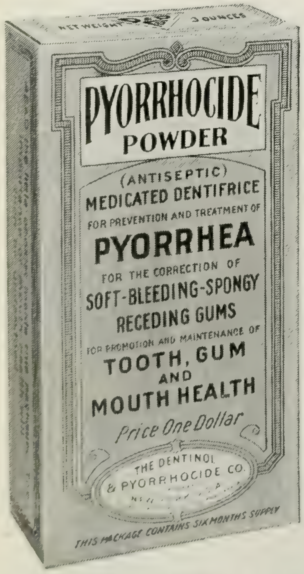
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Samples of PYORRHOCIDE POWDER, and complimentary bottle of DENTINOL for treating pyorrhea at the chair mailed on request.

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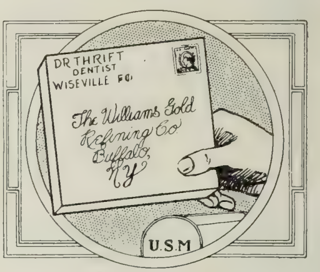

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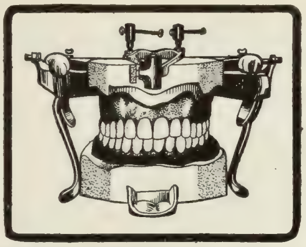

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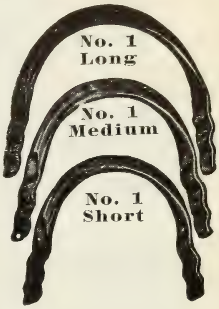

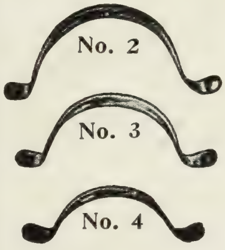

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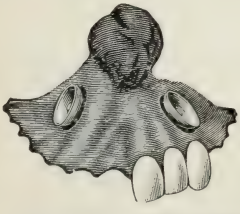

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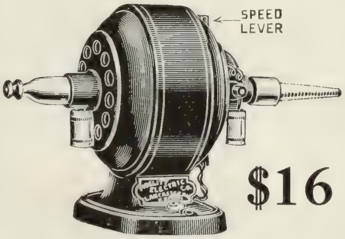

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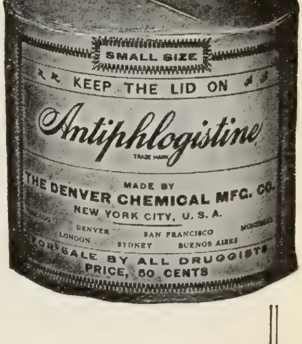

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1917 ANNOUNCEMENT

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The next session will be held in New York City beginning July 2, 1917, and continue for eight weeks. Applications for the 1917 session should be in the hands of the secretary at an early date in order to insure a place, as the class is limited.

Prospectus of the school and further information may be obtained direct from

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Instruction is provided through didactic lectures, laboratory work, technic training and infirmary practice under skilled supervision.

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